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<tr>
<td>Keynote</td>
<td>John Besley</td>
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<td>Communication strategies for scientists and science communicators</td>
<td>The scientific community would benefit if science communicators behaved more strategically when making communication choices. Doing so could increase the likelihood that the time and resources we put into communication advance the scientific enterprise. Being truly strategic in science communication likely means starting with the identification of clear, long-term, audience-specific behavioral goals. It should then involve using theory and evidence to prioritize intermediate communication objectives that have the best chance of achieving the identified goals, as well as communication tactics that have the best chance to achieve the prioritized objectives. Tools such as dialogue, storytelling, audience-analysis, and jargon-free communication are useful tactics, but they are not strategies, goals, or objectives. Similarly, increasing scientific knowledge and excitement are often key intermediate objectives but rarely the end-goal of communication. A first step to becoming a more strategic communicator is to understand (a) the difference between long-term behavioral goals and intermediate communication objectives, and (b) the range of communication objectives that communicators can choose. This talk will suggest just two main types of goals and a limited range of objectives that most science communicators need to consider. These two goals include changing either audience or communicator behavior, or legitimacy judgments. Potential communication objectives include evaluative beliefs about the natural world (i.e., scientific knowledge), other people (i.e., trustworthiness, social norms), and behaviors, as well as a range of discrete emotions and frames. Knowing more about goals and objectives enables nuanced, evidence-based, and creative discussions about the infinite range of tactical choices available to science communicators. The talk will be grounded in research conducted by the author and his colleagues over the last decade. This work includes personal interviews and quantitative surveys with scientists, as well as interviews of communication trainers, foundation leaders, fellowship-program managers, and others. The underlying ideas also originate in research about the social psychology of behavior change, trust and fairness. It also draws on thinking about strategic communication and organizational strategy. Two tensions that will be addressed throughout the talk include the ethics of behavior change, and the challenge of goal-setting for scientists focused on basic or discovery science.</td>
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<td>Keynote</td>
<td>Ewine van Dishoeck</td>
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<td>IAU100: Celebrating a century of progress in astronomy:</td>
<td>IAU100: Celebrating a century of progress in astronomy: In 2019, the International Astronomical Union (IAU), commemorated its foundation a century ago. This was an opportunity to celebrate more broadly the progress in astronomy over the past hundred years and what our field has brought to society, but also to look ahead and reflect critically on IAU’s role for decades to come. Looking back, scientific and technological progress in astronomy has been beyond anything imagined at the time the IAU was constituted in 1919. What will the next hundred years bring? How do we engage with other sciences, now that our field is becoming more multidisciplinary? How do we convince governments and agencies to continue funding the ever more powerful telescopes and satellites? And how do we continue to inspire and involve people worldwide, from young to old, in our exciting adventure through space? This talk will present some highlights and lessons learned of IAU100 as well as a forward look on how the IAU is positioned to carry out its mission: to promote and safeguard astronomy in all its aspects (including research, communication, education and development) through international cooperation.</td>
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<td>Keynote</td>
<td>Prajval Shastri</td>
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<td>Our Obligations while Crafting our Science Communication Practice: Lessons from Investigating Gender Inequity</td>
<td>Our Obligations while Crafting our Science Communication Practice: Lessons from Investigating Gender Inequity - Astronomy has begun to be acknowledged as a powerful vehicle that can enable moving towards a better, more equitable world. Concomitantly, however, it is clear from the evidence from across the globe, that the march of time alone will not address the gender gap in particular and the lack of diversity in general within astrophysics, because discrimination against the marginalised is entrenched in the astrophysics enterprise. It therefore becomes an obligation for science communicators to mould our outward sci-com practice, based on the causality pointed to by the evidence. It further becomes a responsibility to also become critical insiders and drive change within the profession. These ideas will be expanded upon with evidence and examples from the Indian context.</td>
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<td>Keynote</td>
<td>Travis Rector</td>
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<td>Astronomy’s place in the fight against climate change</td>
<td>Simply put, climate change is currently the most important topic for science outreach. Humanity’s response, particularly in the next decade, has critical consequences for what the future will hold. Fortunately astronomy communicators are well positioned to make a difference. We are highly trusted. And we offer a unique and important perspective that can help people understand the problem as well as solutions. Introductory astronomy classes and our public outreach are an effective way to teach climate change because they reach large numbers of people and cover related topics. But we need to recognize that climate change communication is different than the other forms of outreach we do. Climate change is a difficult topic to teach because it spans a wide range of subject areas, from physics to psychology. It is also a controversial topic, meaning that simply knowing the science content is not enough to effectively teach it. In fact, it is now clear that understanding the science is not enough. People largely made decisions about climate change based upon their values and identity. They therefore need to understand how climate change affects things they care about. In my talk I will describe effective methods for teaching climate change in astronomy classes as well as present established strategies for engaging the public. I will also outline ways in which our profession can reduce our carbon footprint. To avoid the worst consequences of climate change, research indicates that humanity must reduce carbon emissions 50% by 2030, and nearly 100% by 2050. I will describe strategies being considered by the American Astronomical Society to meet that goal.</td>
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Astronomy in southern Africa has a diverse and unique history. On the occasion of the bicentenary of The National Research Foundation’s (NRF) South African Astronomical Observatory (SAAO) we honour this heritage and early understanding of astronomy through Khoi and San starlore. This occasion grants us the opportunity to recall our scientific achievements as well as celebrate together our country’s rich and varied cultural heritage. The main campus of the SAAO is of international scientific significance and has been the subject of a UNESCO World Heritage Site report. On December 21, 2018, the South African Heritage Resources Agency (SAHRA) officially declared the SAAO a National Heritage Site. It is important that this cultural heritage is not only preserved but incorporated and celebrated in the context of the SAAO site and history. The SAAO is constructing a new Visitors Centre in Cape Town which will house exciting and engaging exhibits showcasing the science and technology of the SAAO and incorporating artworks, informative exhibits and animations based on traditional Khoi and San starlore. The installations and animations will be accompanied by a conceptual write up of each piece provided initially in four languages: Xhosa, isiXhosa, Afrikaans and English. This multilingual approach to communication and education is at the forefront of inclusivity at the new Visitors Centre, with hopes to expand such offerings in the future into additional national and minority languages. Selected content from the Visitors Centre will also be freely available online. However with internet access being a limiting factor for the newly developed resources, it will take a key role in engaging directly with South African communities. Such commitments to sharing these rare resources is key to furthering education in the field of astronomy and supporting local cultural heritage. The combination of African heritage and modern science makes for relevant and enticing content previously divided in our country’s history. This project is a collaboration between the SAAO and African Tongue, and is a truly unique partnership between astronomers, professional linguists, artists, as well as remaining mother-tongue speakers of Khoi and San languages in southern Africa. The combination of astronomy, art and starlore in the expression of traditional stories through digital storytelling techniques will undoubtedly serve as an example of inclusivity and celebration of African culture into the 21st century.

We present a new initiative, jointly with the IAU Division C Working Group on Archaeoastronomy and Astronomy in Culture and the Royal Astronomical Society (RAS), committed to tackling problems related to sensitive astronomical sites. The Culturally Sensitive Sites group intends to apply everything we have learned in many decades of cultural astronomy studies, so that the astronomical community better understands the conceptions, values, political tensions, and cultural interests among other things at stake when seeking to install and maintain astronomical facilities. The controversy over building the Thirty Meter Telescope (TMT) on Mauna Kea, Hawai’i, is a well-known example of the type of conflict that can arise. Our analysis of the mechanisms by which observatories have been installed on culturally sensitive sites reveals that in general they follow a pattern typical of large extractive companies (for example oil companies, mining companies): agendas are set by international interests; agreements that follow a top-down structure; little or no local participation in decision-making; lack of understanding of the local socio-political situation; assumption that the facility is a ‘universal’ good; lack of knowledge of the first peoples’ cultures, knowledge systems and ancestral knowledge about the sky; and above all the assumption that there is no option for the local community to object to or reject the project. This goes hand-in-hand with two other factors: a) the idea that the remote spaces in which astronomical facilities are sometimes installed are ‘deserts’ or spaces without human occupation — often ignoring the importance of these same spaces for local groups who reside elsewhere; and b) the idea that astronomy is a science that is dedicated to transcendent questions and that it has nothing to do with, and need not take into account, associated political, economic and social debates/realties. All this, added to the prestige of the academic fields of Astronomy and Astrophysics to make their opinion heard without being relegated to a position of ignorance. Beyond the conflicts and how we frame them, we believe that it is of utmost importance for astronomers to collaborate with researchers in disciplines that are familiar with and address these issues. Cultural astronomy is an interdisciplinary area in which astronomers, anthropologists, historians, archaeologists, sociologists, and others can work together and exchange valuable information. Thus, these disciplines have experts who have been studying everything that the installation of an astronomical complex implies for the local population. As a committee we believe that communication, to be real and deep, must go both ways; local and indigenous communities have things to say to astronomers. It is our charge to listen to them and learn from them.

An unprecedented coordinated campaign for the promotion and dissemination of the first black hole image obtained by the Event Horizon Telescope (EHT) collaboration was prepared in a period spanning more than 6 months prior to the publication of this result on 10 April 2019. This talk describes this unusual campaign and its outcomes. The potential global Reach was on the order of billions, possibly as much as 4.5 billion. The result trended as #1 on Twitter globally, reached the top spot on Google News, got its own Google Doodle, and was the most popular story ever published for many scientific organisations involved.

In 2020 the European Southern Observatory (ESO) conducted its first comprehensive evaluation of the broad range of benefits the organisation provides to society in its member states and its host country Chile. These studies quantitatively and qualitatively analysed ESO’s impact in areas such as scientific output, technology development, interactions with industry, advanced training, education and outreach, policy and international collaboration. We analysed different kinds of organisational data to arrive at indicators of impact and interview over 30 stakeholders, including ESO staff, astronomers, policy-makers, industry representatives, science teachers and members of the public, to identify and trace the pathways through which ESO achieves its impact. This evaluation framework generated narratives, case studies, numerical indicators and powerful quotes. Altogether, these materials build a comprehensive and compelling case for ESO’s impact across the five areas of science and engineering, economy and innovation, talent development, education and outreach and international collaboration and policy. To spread the word about the organisation’s societal benefits, ESO’s Department of Communication devised a strategic, multi-channel communication campaign aimed at a broad range of audiences both in ESO’s member states and in Chile. The campaign aimed to reach ESO staff and governing bodies, decision-makers, funders and authorities, astronomy and engineering communities, industry and other collaborators and the public. This session aims to take a critical look at ESO’s approach to identifying, describing and communicating its societal benefits. We will share lessons learnt from the evaluation and the communication campaign. The goal is to trigger a broader discussion about the societal benefits of astronomy and through a dialogue with other communicators arrive at recommendations as to how this complex topic can be approached more effectively by individual institutions and by the community at large.
**Plenary talk**

**Cesare Pagano** (Executive Committee WG Astronomy for Equity and Inclusion – Inclusive Outreach subWorkgroup coordinator)

**Kimberly Arcand**, Kristine Jane Atienza, Jasjeet Singh Bagla, Allyson Bieryla, Elena Cipollone, Mayssa El Yazidi, Rheeane Jimeno, Fabrizio Migliorini, Elsa Moreira, Hafez Murta, Mbongeine Roland Ndunge, Mamta Pommier, Mike Simmons, *Rini*

**Inclusive Outreach subWorkgroup: sharing, learning, experimenting, connecting**

Would you like to show the sky to a blind person, or make a person on 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 the society itself. The IAU Strategic Plan 2020-2030 dedicates a specific strategic goal to “Engage the public in astronomy”. There are many outreach activities happening worldwide all year, but unfortunately, in most of the cases, they are not designed to be accessible also to people with disabilities. Designing an activity to be inclusive means allowing the participation of people with or without disabilities with as much autonomy as possible, in line with the principles of “Universal Design”. Inclusion is a fundamental aspect to guarantee an equal access to astronomical information and communication of the science of astronomy. In many cases it does not require large investments or complex tools, but it does require building the required knowledge and experience. There are several interesting instances of inclusive practices and skills developed by both amateurs and professional astronomers in different countries. In many cases, these are now well defined and tested activities running for many years, with positive feedback from the participants, and a solid skill set built around them. Anyhow these instances are usually isolated and less associative to the public, known to the team that conceived them at regional or national scale. In 2020 the IAU Executive Committee WG Astronomy for Equity and Inclusion introduced the “Inclusive Outreach (Inspiring Stars) subWorkgroup” (IO-sWG), as follow-on of the successful Inspiring Stars project ran in 2019. The mission of the IO-sWG is to foster and facilitate the development of inclusion practices in the astronomy outreach activities around the world, so that also people with disabilities can benefit from the outreach activities and values. The priority that the group set for themselves was to deliver a “Inclusive Outreach Starter Kit” to assist those who are active and experienced in outreach to adopt inclusive practices. This kit is scheduled to be publicly available in March 2021 through a dedicated page on the IAU Inclusion web site (https://iau-oa.oao.nao.ac.jp/iau-inclusion/). There are many other activities that the group is carrying on in support of the main goal of spreading the inclusive outreach practices; they will be published on the IO-sWG web pages as the work proceeds. Anyhow all this will work only if all those involved with astronomy outreach participate by both contributing their knowledge and benefiting from others’ knowledge. This session will cover the details of the IO-sWG, the “Inclusive Outreach Starter Kit”, the other planned activities of the IO-sWG, and how to join and participate to the program and the community supporting it.

**Space Scoop: A Free and Accessible Astronomy Resource During a Pandemic**

**Space Scoop** publishes articles about the latest astronomy news and discoveries from around the world in a language that’s easy to understand and is aimed for younger or laymen readers. Published press releases from various project partners (including the European Southern Observatory, ESA/Hubble Space Telescope, NOIRLab, the National Astronomical Observatory of Japan, the Atacama Large Millimeter/submillimeter Array, and the National Radio Astronomy Observatory) are shared with the Space Scoop team prior to publication. The content is then adapted into accessible language and is aimed to be a valuable and free resource for children, students, parents teachers, and communicators alike. The Space Scoop articles are distributed throughout an international translation network to facilitate dissemination to and throughout various regions worldwide and are also shared as a podcast and web application. The talk will highlight how the Space Scoop project is coordinated, with particular insights regarding how effective partnerships with astronomy organizations worldwide are established and utilized to facilitate cross-promotion of astronomy news. This discussion will also discuss how the material developed can be used by various audiences. In particular, how an increase in engagement with Space Scoop content was witnessed during the COVID-19 pandemic as a result of parents and teachers seeking accessible astronomy material that communicates news particularly for laymen or younger audiences. Specific insights will also be provided of engagement and reach metrics achieved in 2020 across different regions, languages, and astronomy topics.

**A Digital Dome Look at African Astronomy**

**Dr Sally Macfarlane**

**Dr Daniel Cunnam**

How can we effectively use modern planetaria (digital domes) to popularise Africa’s numerous artistic and scientific achievements? Despite the major strides that Africa has made into innovative astronomical research in recent decades, the general public remain largely unaware of these impressive developments or of their significance. Due to the immersive nature and unique capabilities of digital domes, they are often effective and accessible tools to expose and educate a diverse range of people about astronomy and other Science, Technology, Engineering, and Mathematics (STEM) fields. However there is currently very little accessible or local (and therefore relevant) digital dome content highlighting African achievements. Furthermore, a large portion of the astronomy content currently presented is outdated due to a disconnect between science institutes, planetarians, and the planetarium audiences. During this talk, we will discuss the unique capabilities of modern planetaria in popularising Africa’s multidisciplinary achievements and how the Iziko Planetarium and Digital Dome (based in Cape Town, South Africa) is now involved with the Data2Dome Initiative, a global effort which aims to integrate up-to-date astronomy data into today’s real-time fulldome planetarium systems. We will also discuss the importance of creating new local digital dome content, highlighting the production of Africa’s first full-length high-resolution planetarium film, called ‘Rising Star’. Lastly, we’ll address some of the potential challenges we could face in producing future digital dome content, with a look at the upcoming short feature film about African starlore, to be offered in multiple languages.
Development of astronomy outreach projects by forming an amateur astronomers’ community around the Planetarium

The new Irkutsk planetarium [IP] was opened in 2015 in the city of Irkutsk (population 620,000), Siberia (near Lake Baikal) after the old state-owned planetarium was closed in 1986. The new planetarium is the first private-owned in Russia. It hosts a museum and a city public astronomical observatory. Only the IP develops and implements astronomy outreach public activities for the local community. As a private facility, it has to face the personnel shortage and high operational costs caused by the low exchange rates of Russian ruble and to run on a tight budget due to the diminishing buying power of the population. A way to address this challenge is to unite human and financial resources by forming a community of people who are eager to promote public outreach projects in the field of astronomy. There are two projects that have already helped to reach this goal. First, regular deep-sky observation sessions outside the city that were started in August 2015 by the IP. The people who already had telescopes and were interested in astronomy became permanent participants of this activity. The Planetarium gave them opportunities to come to know each other and share their experience, and they formed an informal community «Friends of the Planetarium». The second project is International Sidewalk Astronomy Night (ISAN) – the outreach movement started by John Dobson in 2007. Irkutsk was the first city in Russia to participate in this activity in 2007, and since then, ISAN was held in Irkutsk on annual basis. The IP became the main organizer of ISAN in Irkutsk in 2015, and in 2015-2017, it provided free public observations at 6 locations in the city. In 2018 this event took place not only in Irkutsk but also in 4 other cities thanks to the involvement of the Friends of the Planetarium with their own telescopes. 15 locations in 5 cities and 35 telescopes attracted about 4000 people. In 2019 the event involved 24 locations in 12 cities and villages, 53 telescopes and about as many visitors as before. Moreover, since 2017 the Irkutsk Planetarium and its friends organize in the region International Observe the Moon Night events. In August 2019 a non-profit non-governmental organization Irkutsk Regional Astronomical Organization (IARAO) was established. 11 people (2 of them are planetarium staff) became its founding members. IARAO started with an outreach project «Telescopes for all». Funds were successfully raised with a crowdfunding campaign. The succeeding project «Telescopes for Siberian Villages» was funded this year by the International Astronomical Union’s Office of Astronomy for Development. 7 telescopes have already been distributed to the newly formed groups of amateur astronomers in remote villages and small cities, and 8 more will be distributed in 2020. Thus, we have a strong win-win collaboration of a private company, a non-profit organization, and local communities.

Exploring creative approaches to virtually communicate astronomy

Making Space (MS) is a science public engagement project designed to bridge the gap between underrepresented groups (socially, economically and educationally disadvantaged) and astronomy. The MS programme aims to broaden and deepen the breadth of astronomy by weaving it into public installations, music events, and outreach with diverse communities across the region. Since 2018, the project’s activities have focused on deepening the understanding of community-based practices and developing creative approaches to astronomy education and outreach that could empower the community to be engaged with science. Guided by the Universal Design for Learning (UDL) principles, we aimed to create an environment in which everyone, regardless of their background or previous knowledge, could benefit from our activities. As part of the Making Space Programme, we explored the potential of combining arts and astronomy in a community-based programme, which had two main objectives: (i) to investigate the use of approaches that valued the importance of exchange and collaboration among participants for astronomy education; (ii) to explore the use of art as a powerful way to engage a diverse community with astronomical concepts in an informal learning environment. One of our main activities is an intergenerational programme, in which a group of teenagers and members of a local active retirement group meet once a week to learn astronomy together through arts. During the programme, a number of approaches were developed to facilitate the learning of astronomy and positive interactions among the group. The content of the programme was designed based on the initial assessment of the participants’ interests and prior content knowledge of astronomy. Based on these assumptions, the authors were able to carefully prepare accessible materials and resources to ensure that the astronomy content was inclusive to all learners regardless of their background and to involve both groups of participants as much as possible throughout the activities. It included topics such as galaxies formation, solar system, black holes and the benefits of astronomy in our lives. In this talk, we will discuss the lessons learned from the activities design and implementation during the COVID-19 outbreak in the context of public engagement work to different groups with differing levels of technological awareness.

Building a legacy: STEM Clubs in low socio-economic areas of the UK.

How do we raise aspirations and awareness of STEM subjects (science, technology, engineering and maths) in school students from communities that are traditionally under-represented in STEM? We need to go beyond the relatively narrow, results-focused constraints of timetabled teaching. One important tool is a STEM Club - run outside lessons and with a flexibility that curriculum-focused teaching cannot have. Unfortunately, the students who have most to gain from such clubs will often be in low socio-economic areas, or from demographics that suffer from widespread discrimination, where schools and teachers are already most limited by time and resources. Here at the National Schools Observatory (NSO - www.schoolsobservatory.org), we are using the fascination with space and astronomy that many young people have to encourage a wider appreciation of STEM. We have produced a suite of STEM Club packs for both Primary and Secondary schools. We are working with schools in targeted areas of high educational deprivation in England (we intend to introduce the project to schools in other UK nations in the near future) to deliver the STEM Clubs. Our goals are: (1) to establish STEM clubs that have a legacy in their schools beyond our intervention; (2) to produce a best-practice case study for other schools to use. In this presentation we will communicate what have learned from the production of the STEM club packs, how we have worked with other public engagement professionals to reach under-served communities, and what we have learned so far about what works (and what doesn’t) for schools in these areas. We will also reflect on how the project changed and evolved as a result of the UK response to the Covid-19 pandemic.

Contribution of astronomy for the fulfilling life of the elderly citizens

Recently, especially in advanced countries, aging is quickly progressing, and opportunities for lifelong education for the elderly are increasing. In such a situation, astronomy has a certain capacity to contribute on the learning of elderly citizens. However, the physical performance and learning needs of elderly citizens is in fact different from younger generations. Hence, we need to adapt the way of study astronomy to properties of elderly learners. By creating an astronomy education program that takes these characteristics into account, we are able to apply astronomy as life-long education for the elderly effectively. As a first step, here we reconsider the differences in learning needs of the elderly citizens and discuss the role that astronomy can play. We will also examine how astronomy can be tailored to the needs of the elderly to make their learning more efficient.
Plenary talk: Andrew Fraknoi, Dennis Schatz, Suzy Gurton, Greg Schultz
Training Early-career Astronomers for Effective Outreach: The AAS Ambassadors Program

We present information on the American Astronomical Society Outreach Ambassadors program, which has, since 2013, offered annual workshops and trained more than 250 early-career astronomers to be more effective at community and classroom outreach. Beginning as a legacy program envisioned by AAS President Debra Elmegreen, the Ambassadors workshops were developed and presented with the Astronomical Society of the Pacific (which has had long experience in doing projects in education.) In two-week, intensive, hands-on workshops before the large winter meetings of the AAS, we trained roughly 35 graduate students, post-docs, and new faculty each year in techniques and materials that would help them present astronomical ideas and developments to non-technical audiences in a wide range of settings. "Graduates" of the workshops become part of a "community of practice," through which they can assist one another with outreach challenges in their careers. Follow-up webinars are offered each year, focusing on some practical aspect of astronomy outreach. The project also developed a web-based guide to outreach resources and opportunities, called the M.O.O.S.E. (which is available at: https://aas.org/education/moose-menu-outreach-opportunities-science-education.) We report on a survey of 90 of the Ambassadors, which shows that the training has had a positive effect on their careers and their own sense of effectiveness. While this program is focused on North American astronomers, we believe that something similar may be useful in helping astronomers in other countries become more effective in explaining, and advocating for, their science. (Note: We are especially grateful to Dr. Richard Fienberg of the American Astronomical Society for his extensive help in organizing, publicizing, and carrying out the workshops.)

Plenary talk: James Creighton
Dancing Cats and Interplanetary Ballet - Short Form Media Production
When You Have No Time or Money.

Creating feature length full-dome planetarium content is beyond the reach of most planetariums and their staff. Plus, the past year has forced most domed facilities to suspend operations for in person events altogether making such media nearly impossible to deliver. However, there are now plenty of other modes of interaction we can rely on to help bridge the gap unless we can safely gather again to marvel at the splendors above us. I'll share our work done in the last year that aims to simplify the production of short, small scale media intended for mobile screens and short attention spans. Using the open source software package OpenSpace, in combination with standard video editing tools, planetariums can offer informative, high-quality, and perhaps most importantly, astro-physically correct mini-clips for their target audiences - even if they can't be seated comfortably in the dome yet. While they can't compete with falling cats or catchy dance moves for engagement (yet), there is nonetheless a robust interest in casual and informative space related content. Examples include standard "night sky" vistas to highlight current observation interests for backyard astronomy in a certain locale, unique time-lapse style scenes showing long term planetary motion and celestial views from hard to reach places, and even more adventurous tours of other worlds that use the gorgeous topographies and images acquired from recent space missions. We'll discuss how to produce these and more with little to no prior experience necessary.

Plenary talk: Primo Fraknoi
Astronomy in the land of avocados
Michoacan is a state in Mexico which faces important security problems, mostly due to narcotrafic. That implies that many towns and small cities are practically isolated and do not have easy access to the state's capital city, Morelia, where most of the educational and cultural activities take place. The Institute of Radioastronomy and Astrophysics of UNAM implemented two projects to try to bring astronomy to people who do not have easy access to it. The first project took place in a neighborhood very close to the University, but still far apart in practical terms. It is a very marginalized neighborhood with high levels of delinquency. People from this neighborhood do not commonly participate in activities carried out in the University for two main reasons: they do not feel part of the University and insecurity to attend activities when the sun has already gone down. La UNAM en tu Tenecia was a project to bring the activities to the community. The second project was for towns outside the city. The objective was to carry out an exchange of knowledge between the University and these communities. Additionally, astronomy workshops were put together in a kit which included audiovisual and written support materials for teachers to be able to implement them in their schools continuously.

Plenary talk: Farsa Bigdeli, Saeed Jafari, Ziba Ahmadi
The impacts of content strategy on pseudoscience reduction and prevention in social media

As an ancient knowledge, astronomy has had a great influence on different cultures. With science and technology advancement through time, this ancient knowledge has been converted to a major branch of science. However, various cognitive and cultural factors led superstitions to emerge in a new format called "Pseudoscience" which made an important mission for Astronomy to reduce pseudoscience. With the development of the age of social media, a true content strategy has become inevitable for reducing pseudoscience. Nowadays, there are so many media (e.g., Instagram science-fact-pages) which release fake science news, leading to these pseudoscientific impacts: 1) Learning disorder; 2) Lack of scientific thinking; and 3) Cultural distortion. In this study, we observe Iranian astronomical and science-based Instagram pages and influencers with cognitive and linguistic approaches to evaluate the impact of their function and content strategy on pseudoscience, especially during the COVID era. According to our case study, we also evaluate the pseudoscience representation in Iran (as a country with a different religion, culture and politics) and we compare it with other countries. In conclusion, we mention some suggestions with cognitive, linguistic, philosophical, etc. approaches to modify content strategies for scientific social media to reduce and prevent pseudoscience.

Plenary talk: Jean Creighton, Nathaniel Schardin, Victoria Robison
Seeing the solar system with fresh eyes

The solar system is a beloved, familiar topic for informal and formal programs in planetariums (regardless of whether their projectors are digital or optomechanical). It is easy for such programs to become a list of facts quite divorced by how we have come to understand what we know or how it connects with current issues especially. Furthermore, it is hard to build a rapport with the audience if the program is a movie with little or no interaction with a person. To add to the challenge, most public programs are 45-60 minutes long and can include people with vastly different prior knowledge about the solar system and its exploration. To address these issues, the Manfred Olson Planetarium at the University of Wisconsin-Milwaukee offered two live virtual presentations of a program called "Secret Lives of Planets" which looks at the solar system from the point of view of visiting aliens from a planet around the Sun's twin star. The live presenter, astronomer Jean Creighton, discussed what would surprise these aliens about our solar system. This alien approach allowed for many popular topics to be explored in a new way: from what would aliens make of Pluto to how they would know there is life on Earth. The best part? The audience asked questions that resulted in a real-time authentic conversation between a scientist and members of the public, which is important in building trust and understanding.
| Oral presentation | Christine Matsuda | Mary Beth Laychak | 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. Priorities for this work include: - Dedicating concerted effort to authentic, personal engagement at all levels of community, leading with relationship-building and listening. - Actively seeking out real needs and collaboration opportunities identified as community priorities; offer meaningful support (time, labor, skill and funding) without prioritizing self-interest. The talk will use specific examples of key lessons learned, approaches implemented and programs underway to lead participants through an example of community engagement planning exercises to: - Think critically about which stakeholders your organization reaches and where your blind spots may be. - Analyze existing outreach activities to identify opportunities to strengthen, pivot or improve - Create new pathways to build relationships with your communities. |
| Oral presentation | Sze-leung Cheung | Social marketing tools for astrotourism and dark skies campaigns | Astrotourism is not anything new but during pandemic and linking it with the local economy is helpful for local business. Health and economics concern are the priorities during the pandemic, communicating astronomy at this difficult time should address the concern of people who are under great risk of their lives. Running dark sky and astrotourism program requires to work with a lot of people in the non usual target group, therefore social marketing skills is very helpful, and techniques such as Value Proposition, Relationship Mapping, Solution Prototyping are helpful to bring in new insights. This workshop can be done virtually through discussions and some simple tools. We will also provide a short summary of case studies of success and challenges we faced in Thailand. |
| Oral presentation | Travis Rector | Jeff Bennett | How Can Astronomers Better Talk About Climate Change? | Astronomers are in an excellent position to help people understand the causes and consequences of climate change, as well as solutions. Many of the topics we teach and talk about are directly related to climate change, including topics like planetary atmospheres, exoplanets, and astrophysics. In this workshop, Travis Rector (the chair of the Sustainability Committee for the American Astronomical Society) and Jeff Bennett (author of A Global Warming Primer, www.globalwarmingprimer.com) will lead participants through ways we can use the high profile of astronomy to support education and outreach about climate change. The session will begin with Jeff presenting a brief overview of the approach he has taken in his Primer and in public talks across the country, then Travis will discuss incorporating climate change into your teaching and public outreach. The workshop will be interactive and will have plenty of time for Q&A and discussion. |
| Oral presentation | Pamela Gay Laychak | Avivah Yamani | Building a Purposefully Compassionate Astronomy Community | In 2020, many of us woke up one day to realize that all our casual meetings with colleagues, collaborators and friends could no longer safely take place face-to-face. While many projects have long had an online presence, ranging from digital forums, to WhatsApp, Discord, Telegram, and Slack channels, these online communities were often augmenting real-world activities, or at least weren’t the primary means through which community members socially engaged with other people. With the COVID pandemic, however, online astronomy communities became a safety net for members who sometimes just needed to scream into the void and know they were being heard. At the time of this writing, there is some hope that COVID will be brought under control [although it isn’t a given], but even if vaccines in time allow this hurdle to be overcome, the environmental impacts of travel, and the possibility of future pandemics makes it necessary for us to build robust online communities that not only support our audiences in learning and doing astronomy, but that also address our audience members as humans who need and want to engage with others socially. In this workshop, Gay and Yamani will share their experiences growing communities of astronomy enthusiasts, learners, and citizen scientists. They will leverage their lessons learned to walk you through the questions you must ask in defining a new community, and the actions you can take to make your community safe and nurturing for new members. We will look specifically at how to handle non-neurotypical community members, strategies for addressing deeply held misconceptions, how to leave room for people to make mistakes while keeping the community safe, and tactics for making sure all feel welcome. Sometimes, the needed actions are as simple as addressing anyone who hasn’t stated their gender as “they.” Come learn from our mistakes, and let’s together build more places for people to come together around astronomy. |
| Oral presentation | Nicolas Cowan | Lan Xi Zhu, Julie Bolduc-Duval | Using the Climate App to learn about Planetary Habitability (and Climate Change) | The goal of this workshop is to familiarize educators with the Climate App ([https://www.climateapp.ca/](https://www.climateapp.ca/)) so that they feel comfortable using it in their classrooms. This web app describes the radiative transfer that governs planetary climate. Climate models of this complexity have existed since the late 19th century and are sufficient to explain such concepts as Global Warming, the Faint Young Sun Paradox, Snowball Earth events, or the habitability of the TRAPPIST-1 planets. The Climate App is user-friendly and intuitive, it works well on cell phones or other devices, and does not require lightning-fast internet connection. In addition to the beginner version that we will focus on in this workshop, there is an advanced option for students and educators wishing a deeper dive on planetary climate. The App is currently available in French and English and a number of modules are being beta tested and rolled out. |
Oral presentation
Genevieve Marshall, Ramasamy Venugopal
From transactional to impact: the role of fundraising in astronomy outreach
Astronomy outreach inspires children and young people into STEM through a shared excitement for the night skies, especially girls, young women and underrepresented groups. As well as being the gateway into future careers in STEM, astronomy outreach builds capacity in research, encouraging the best talent to stay in the astronomy field. It provides an engaging yet simple route to engage the general public with the importance of science and critical thinking, much needed in an increasingly polarised world where science denial has taken hold in many societies. There are many organisations working globally to support astronomy outreach in a wide variety of contexts. Funding is received primarily from government institutions or multilateral and bilateral agencies such as the European Union. There are also a few notable private funders such as the Kavli Foundation, who have public engagement as a core grantmaking focus. However, there remain challenges to accessing funds for astronomy public engagement. In this oral presentation participants will receive an introduction to the intersection between fundraising and public engagement and some top tips on how to transform their fundraising communications. As a result of attending this session, people will be able to better understand how fundraising and communications combine to support one another through frameworks such as the Sustainable Development Goals, and how this can be adapted to help organisations develop more sustainable financing methods.

Oral presentation
Vanishree Bhalotia
Wonder as a Boomerang: A novel approach to increasing the self-efficacy of science-communicators
The nature of science-communication as a field is open-ended, interdisciplinary, and with its members scattered across the globe. Unlike academic or industry astronomers who have universities and observatories to gather and collaborate at, astronomy communicators are often only connected digitally and have a larger variety of goals. Inadequate science-communication training and the spread-out nature of the field create limited opportunities for peer-collaborations, mentorship, and building community. Additionally, unlike careers in academia or industry, there is no well-established path to achieve success as a science-communicator, and each communicator must trailblaze a unique path suited to their specific goals and audience. The rise of pseudoscience and disinformation poses further challenges and all these factors collectively create a daunting environment for early-career science communicators, especially those who foresee a career in the field. Thus, while a science communicator may quickly become adept in communicating astronomy effectively, they may not be able to communicate it in a way that is sustainable for themselves and may experience burn-out and self-doubt while creating and presenting content. In this workshop, I will present some techniques to increase self-efficacy or one’s belief in their ability to communicate/create astronomical content effectively. I will (1) lead a self-exploration to unravel various areas of low self-efficacy (2) provide strategies to incorporate growth-mindset and audience interpretations in creating and sustaining wonder for oneself as a science-communicator and (3) facilitate transferring ideas to paper, and nurturing early ideas mindfully. I aim to provide a space for a science communicator (of any level/background) to begin to create wonder sustainably for themselves and their audience. I also hope to build upon ways to use wonder as a boomerang, between the audience, the communicator, and their interdisciplinary collaborators.

Oral presentation
David Redeker (NOVA, the Netherlands), Marieke Baan (NOVA, the Netherlands)
Spice up your story: actions, motions, senses
Scientists and science communicators often forget that there is more than just the plain facts. Of course, facts are important for good communication, but perhaps even more important are the descriptions of emotions, actions and senses. The interactive (I) presentation highlights the blind spot of emotions, actions and senses. The presentation revolves around a simple technique with which improvisation actors supplement their stories with actions, emotions and senses. Presenter David Redeker is both an improvisation actor and a science communicator. Since 2018 he has given almost 100 workshops (online and offline) on scientific storytelling. The Spice-up-your-story workshop focuses on one of his favorite techniques. The audience will practice the techniques around the simple, but effective acronym FASE. That stands for Facts, Actions, Senses, Emotions. Note: if you prefer, you can view the presentation on YouTube (with automatic English subtitles): https://youtu.be/av78geuGiE

Oral presentation
Mary Beth Laychak, Shelly Pelfrey, Leinani Lozi, Carolyn Kaichi
Translating the Solar System
The Maunakea Observatories (MKO) annually hold a Solar System Walk by creating a scale model of the solar system through the rural town of Waimea on Hawaii Island. Participants self pace, visiting booths for each planet where they learn basic information about the planets, recent planetary discoveries made using the MKO, and participating in an activity or demonstration. The walk traditionally ends with a Halloween costume contest, lunch provided by the organizers, and prizes. COVID made the traditional walk impossible in 2020, causing the organizers to reimagine the walk. The organizers decided to create a self-guided tour of the solar system with decals on a popular Waimea walking path. The decals scale to the proper distance and include a QR code to a video about the planet created by MKO staff. Those completing the walk can register as solar system adventures and receive prizes via mail. The organizers decided that each video and decal would include content in English and 'Olelo Hawai'i. They created a basic script for each planet enabling translations by Leinani Lozi, education specialist at the Gemini Observatory and student of Ka Haka 'Ula O Ke'elikōlani, the University of Hawaii at Hilo’s College of Hawaiian language with research done by Alexis Ann Acohido from the East Asian Observatory. The panel discussion includes the key organizers of the Waimea Solar System Walk: Canada-France-Hawaii Telescope director of strategic communications Mary Beth Laychak, W. M. Keck Observatory outreach coordinator Shelly Pelfrey, University of Hawaii Institute for Astronomy education/outreach specialist Carolyn Kaichi, and Gemini Observatory/NOIRLab outreach assistant/Solar System Walk translator Leinani Lozi. The panelists will provide an overview of the revamped Solar System Walk, a discussion of the decision to include content in 'Olelo Hawai'i, the efforts required to translate/film the scripts into 'Olelo Hawai'i, and the Solar System Walk’s impact on future MKO events.

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Oral presentation
Saeed Jafari
Amirreza Kamkar, Mehrsa Latani, Atabak Akson, Mahdi Abdollahi, and Hadi Aghaie
Communicating Dark Sky in Iran: Heritage of the Sky Project Achievements and Challenges

"Heritage of the Sky" is a project to raise public awareness of the beauty of dark skies, the impact of light pollution and make historical and natural heritage accessible through social media campaigns, citizen science and education and outreach projects. Our mission is to promote and safeguard natural, cultural, and historical astronomy and national heritage sites, including education, outreach and development through international cooperation in an online portal. The IAU100 Special Project "Heritage of the Sky" sought to link night sky conservation and national heritage by inviting professional and amateur photographers to submit their astrophotos capturing natural, cultural and historical heritage. The contest provided a notable graphic collection of resources of the natural, historical and intangible heritage and allowed nightscape photography with official permission in all Iranian heritage sites. People in different gender backgrounds submitted over 200 photos with informative storytelling from relevant sites. Finally by organizing the award ceremony was the aim to bring astrophotographers, amateur astronomers and policymakers together to discuss and tackle how to empower the public with the tools and resources to help bring back the night. In this roundtable, we will discuss some of the key factors considered behind the planning and designing of the initiative and methods chosen to preserve the dark sky, how we were implemented in practice and discuss the effect of the chosen methods and suggestions of future projects as well. We will review different ways of approaching the dark and night sky in several cultural landscapes and geographic regions, from over the Plateau of Iran to the bottom of the desert and how we can use them today for education, outreach and heritage management.

Oral presentation
Andrew Fraknoi
Others who expressed interest in this topic
A Panel on How Astronomers Can Effectively Respond to Pseudo-science and Anti-science in a Time of "Alternative Facts"

We explore the popularity of the "fiction science" called astrology, examine its origins thousands of years ago, and then present some of the many scientific tests that demonstrate it has failed in our time. There will also be time for a Q&A. With tongue in cheek, we present a "competing" theory called "jetology" where the position of all the jumbo jets at the moment of your birth can help illuminate your destiny and love life. We suggest some good, skeptical questions that students or audiences can ask when looking at astrology. As time permits, we can connect astrology to other astronomical pseudo-sciences, such as UFO's being alien space ships, ancient astronauts helping humanity build all the great monuments, Flat-Earth belief, cosmic catastrophes that are manifest threats to life on Earth, and a disbeliever in the cosmological age of the universe. I keep a resource guide to how instructors can respond to astronomical pseudo-science at: http://bit.ly/pseudoastroMy article, expanded from one in Sky & Telescope, suggesting skeptical questions to ask about astrology is at: http://bit.ly/astrologydebunked Again, my thought was that this would be part of a panel or other group session in the broad area: Anti-Science Actions. Disinformation & Fake News.

Oral presentation
Kiana Kade
Chiara Ceccobello
Rymdskolan: breaking stereotypes and increasing science capital in Sweden

In this talk I will discuss a new initiative developed at Chalmers University of Technology by a group of astronomy PhD students and post-docs called 'Rymdskolan: Bringing the Universe closer'. We were invited to a rural school in the Göteborg region for this initiative. We target the primary school students as we see it as a unique opportunity to improve the space awareness of the children here. We have set up a series of workshops around different topics (e.g. the solar system, stars and galaxies) and each workshop has a few main topics but also room for discussion and questions. In the end, the students are given a book that contains all the material presented and the names of all the students, their group and school. This has been well received by the students and we hope that it will encourage them to continue with science education in the future. The main goal of this initiative is to create a foundation for further interest in science education and to give the children a positive experience.
Oral presentation
Nareemas Chehlae
Areefen Rassamesard, Public Outreach Officers from Songkla Regional Observatory for the Public

Astronomy Education and Public Outreach during the COVID-19 Era in multicultural region in the Deep South of Thailand

As the world struggles with the spreading of COVID-19, however astronomy public outreach have been performed in Thailand through interested, educational, new normal and engaging online activities as much as possible. Some astronomers in Thailand have taken this global crisis as an opportunity to set about outreach in new and different ways. As astronomy lecturers in Prince of Songkla University, Pattani campus, we have been provided academic services, training, astronomy camps, monthly stargazing events and crescent moon sighting activity to students and interested person. During COVID-19 pandemic, we have developed astronomy online learning contents in various topics and activities for students and teachers through social media, such as YouTube and Facebook. In addition, we have also organized astronomy online training for high school teacher by using Zoom, Microsoft team and Google meet cloud meeting. Fortunately, our astronomical activities were supported from Songkla Regional Observatory for Public, which is under the National Astronomical Research Institute of Thailand (NARIT). The observatory plays an important role to develop astronomy in this region. It provides academic services for the local communities and supports the implementation of astronomical curricula in schools and universities. It also serves as another astro-tourism landmark in southern Thailand. Moreover, southernmost part of Thailand is a unique remote area; cultural diversity, educational inequality, and the specific conflict problem here are massive obstacles to develop science and astronomy in the area. In the fight against the obstacles, most of professional and amateur astronomers are actively working together to communicate science and astronomy to society, especially children, that aims to provide inspiration to them, increase astronomical knowledge and decrease some conflict problem in the area. However, sustainable development in astronomy and support from international organization are still needed in this region.

Oral presentation
David Tovar
María Angélica Leal, María Trinidad Ceferino, Jimena Sánchez Nieves.

Audiovisual material and forums as a pedagogic tool for raising awareness among the public about the importance of astronomers and scientists in Colombia.

In Colombia, scientific work is unknown by many of the population, including colleagues who work in fields with relative similarity. To raise awareness about the importance of scientific work in the country, the Planetary Sciences and Astrobiology Group of the National University of Colombia designed three strategies that contribute to science outreach. These strategies are 1) The heroes in Colombia wear a gown, 2) Get involved with Science, and 3) Tuesday’s coffee and science. These strategies are part of the research project: Evaluation of strategies for the outreaching and communication of science. Using audiovisual material and discussions in forums, teachers from public and private schools have designed activities for their students, highlighting the importance of scientific work for our society.

Oral presentation
Eva Lafay
Sanne van Gammeren, Maria Vicente, Pedro Russo

Makerspace for astronomy with STEAM education in a learning ecosystem: the Old Observatory Leiden

Astronomy is intrinsically an interdisciplinary topic. It notably combines biology, chemistry, physics, mathematics, environmental and computer sciences but also history, visual arts, project management, and global citizenship education. Astronomy can therefore be a tool to implement STEAM education (Science, Technology, Engineering, Arts and Mathematics). STEAM education offers learners essential skills and knowledge for individual empowerment and societal engagement. It forms youth to face future complex challenges at local and global levels. Yet, despite the richness of astronomy and STEAM education, they face challenges to integrate the formal settings in schools. There is a lack of time, resources, as well as pedagogical and institutional knowledge. Teachers are already overloaded by their work and can feel a lack of confidence to teach science. To tackle those issues, we aim at creating and strengthening the bridge between primary school students and astronomy in a meaningful way. We want to develop an after school programme that extends learners’ opportunities to engage with astronomy and STEAM education. An innovative way to engage the students in such activities is through makerspaces. These places are spaces to create, collaborate, learn with a pluralistic approach, and support change. In makerspaces, participants can create meaningful collaborative projects established upon everyday life, local goals, and resources. The Old Observatory Leiden (the Netherlands) is therefore looking into ways to engage the children with astronomy through such a Makerspace. To guarantee that we will develop a makerspace that is relevant, we are fostering collaborations between primary school students in Leiden and the Old Observatory. We will conduct interviews with different members of the (educational) community and look into case studies of other makerspaces that already integrate STEAM and astronomy in their programmes in order to collect their best practices. In this presentation, we will present the preliminary results of this project, show the research set-up and co-creation tools and share best practices.

Oral presentation
Joanna Holt
Joris Hanse, Marieke Baan

From Dome to Desk - Live Interactive Planetarium Shows in COVID Times

As part of a larger Education and Outreach strategy, The Netherlands Research School for Astronomy (NOVA) coordinates a group of three inflatable mobile planetariums which visit around 200 primary and secondary schools per year (+30,000 students/year). Normally a full class of 30 students, plus the teacher and NOVA presenter, would squeezed into the 5.5m-diameter inflatable dome, but in the new normal of social distancing plus other restrictions, this just isn’t possible. So how do you continue to reach students when it isn’t safe to work with the dome? NOVA got straight to work during the first wave of the pandemic in the spring of 2020, investigating various options and finally investing in a high quality flat-screen. This enabled school visits to continue once schools were reopened in the summer of 2020. When infection rates increased again in the autumn of 2020, NOVA continued to innovate and find solutions, this time to provide virtual live interactive planetarium shows via platforms such as Microsoft Teams. Both schools and the NOVA presenters are enthusiastic about the COVID-19 safe approach and this has led to requests from schools quickly returning to two-thirds of pre-corona levels in the first months of 2021.
| Oral presentation | Anna Voelker, Michaela Deming | SciAccess: Advancing Disability Inclusion in Astronomy Outreach | People with disabilities comprise the world’s largest minority group, and yet this 15% of the world’s population is severely underrepresented in astronomy. This session is dedicated to breaking down these barriers by equipping participants with the knowledge, perspectives, and resources necessary to become catalysts of change in their own sectors of the astronomy community. From inclusive space science outreach pedagogies to accessible astronomy conference strategies to enabling the future of disabled astronomers, this interactive session will showcase the latest advancements in space accessibility. It will also demonstrate cutting-edge outreach resources, such as data sonification and 3D printed astronomy models, that are empowering the next generation of disabled space scientists and engineers. Session attendees will be invited to critically evaluate the accessibility of their own work or academic environments and will be challenged to develop inclusive astronomy outreach approaches. This session will showcase the ongoing work of the SciAccess initiative, an international effort dedicated to promoting disability inclusion in STEM. It will share the results of SciAccess 2020, a virtual conference that brought together 555 attendees from 46 nations and all 7 continents. Participants will learn about upcoming SciAccess events and will be invited to join the SciAccess Working Group, providing them with an opportunity to connect with others who are passionate about STEM inclusion. This session will also share lessons learned from the SciAccess Zenith Mentorship Program, an ongoing virtual program that prepares blind and low-vision high school students for careers in astronomy. Attendees will leave this session with techniques, guidance, and ideas on how they can conduct outreach and mentorship efforts that promote astronomy accessibility within their own communities. Participants will be encouraged to rethink diversity, equity, and inclusion as essential priorities that benefit not only marginalized individuals, but astronomy as a whole. By welcoming new perspectives into the field through accessible outreach and public communication, we are unlocking new talent and ideas, enriching our research, and advancing scientific discoveries for the benefit of all humankind. |
| Oral presentation | Morrell S A F, Davies C L, Bate M R, Mills A, Whitehead N J, Rieder S, Hatchell J, Krijt S, Mayne N J, Thomson S I, Rescigno F, Houge A, Brunt C M | Sharing the 2020 Great Conjunction with the World | On 21st December 2020, Jupiter and Saturn, the two largest planets in the Solar System, came closer together in the sky than they have been since 1623, appearing less than one-fifth the apparent diameter of the full Moon apart—an event known as a Great Conjunction. With this event, came the possibility of engaging people in the wonders of our Solar system, the orbital mechanics that drive it, and the physics and mathematics driving planetary climates. With a second lockdown looking imminent in the UK, and with it the impossibility of organising in-person events, the team from the University of Exeter and Exeter Science Centre in the UK innovated to communicate this event to the world. We designed and organised an online campaign, including a website for the event (http://jupiter saturn2020.org/), pre-event educational video content, and a live stream interleaving segments from team members and live views of the conjunction through a telescope to engage with the world. In parallel, we collaborated with Exeter-based community placemakers, Interwoven Productions Cic, to engage thousands of residents in Exeter through community-run COVID-safe star parties, an immersive play themed on Jupiter and Saturn which toured local primary schools, and a week-long shop front installation in the city centre featuring bespoke print and digital media themed around the Great Conjunction. Our shop front display alone received over 3000 engagements, with countless others in the community being involved in our local events. Our online campaign accrued a total of over 1 million views from over 100 different countries around the world; with our 2-hour live stream itself achieving a peak of 3666 concurrent live viewers. The team, and write ups of the event, appeared in nearly 200 different regional, national and international media outlets; including an upcoming article in the Royal Astronomical Society’s Astronomy and Geophysics magazine. This project leaves a legacy value, both through the learning materials that resulted from it, and from the thousands that have signed up to hear about our future events. |
| Oral presentation | Onuche Ogu, Ilihun Ibe, Toyin T, Iyamho O, Okeke M | Astronomy Learning Hub: Communicating Astronomy with IDP Children in Nigeria (IDP-CAO Project) | In Nigeria today, ethno-religious conflicts have displaced over 3 million people, mostly women and children. The government setup temporary camps as shelter for these displaced persons, popularly known as IDP camps (Internally Displaced Persons camps). The main aim of the IDP-CAO project (Internally Displaced Persons-Children’s Astronomy Outreach Project) was to use astronomy as a tool to counsel, heal and inspire traumatized children that have been displaced due to ethno-religious conflicts. One of the main deliverables of the project was a solar powered astronomy learning hub which comprises of solar panels, inverters and batteries for power; Smart TV, Internet router, HD drive, tablets and Desktop PC for astronomy. Astronomy education material was preinstalled in the learning hub to help communicate astronomy to the children. This project employed interdisciplinary approach to holistically achieve it aims and objectives by using a team of professional counsellors to conduct cognitive behavioral therapy assessments. This approach was done to gain insight on the state of the mental health of the children and to gain their trust. Data from the psycho-social therapy assessments and the impact of the project have been analyzed. |
| Oral presentation | Lars Lindberg Christenssen (NSF’s NOIRLab) | Astronomy Communication in an Organizational Context | A communication department in a large science organization is a very multifaceted organism with dozens of staff roles, channels and activity types. The purpose of this presentation is to give a better understanding of the different factors that contribute to making the communication of the results of a large scientific infrastructure, successful. Although much of the knowledge presented here is based on circumstantial evidence and simple key performance indicators and metrics, significant “lessons learned” can be extracted that may be interesting to other practitioners and can inform their decisions. The presentation offers some solutions to standard corporate communication problems such as licensing, digital assets management, optimization of in- and out-sourcing staffing resources as well as workflow management. The presentation is based on decades of experience from setting up and running successful communication and education units such as ESA/Hubble, the IAU Press Office, the International Year of Astronomy 2009, the ESO communication office, and the NOIRLab communication and education unit. |
"Touch the Universe" Tactile Exhibition Anywhere in Japan

"Touch the Universe" is a special exhibition with tactile models of celestial bodies and telescopes which both blind and visually impaired (BVI) people and sighted people can understand and enjoy. The first exhibition was held at Tactus Museo (tactile museum) of the Japan Braille Library in 2018 with the Subaru Telescope and the asteroid Ryugu models created with a 3D printer at the National Astronomical Observatory of Japan (NAOJ), and the second one was held at Akashi Municipal Planetarium in 2019. The third one is being planned at Sendai Astronomical Observatory. Akashi Municipal Planetarium working with the three other organizations, created a whole set of the "Touch the Universe" tactile exhibition with a JAPAN Science Museum Association grant. The whole set enables science museums and planetariums in Japan to hold a similar exhibition easily without using a 3D printer. The whole package includes movies and audio guides with a QR code that both BVI and sighted people can scan. In addition, we are planning to hold inclusive astronomy workshops for museum staff members who are planning the special tactile exhibition.

The workshop's purpose is to increase awareness of inclusive astronomy and share tips for communicating with BVI people. The whole set of the "Touch the Universe" tactile exhibition and optional workshops are expected to expand the national network of inclusive astronomy.

How to build an Affordable Planetarium

Sutherland, a small Karoo town in South Africa, is known for two things, the cold and the fact that it’s home to the Southern African Large Telescope. With astronomy growing in popularity the town’s tourism industry tried new ways of entertaining guests with a desire to learn more about this universe we live in. Marina Van der Merwe, the co-owner of one of the largest guest farms in Sutherland had the idea of constructing a Planetarium with the sole purpose of entertaining visitors during daytime and on overcast evenings. She gave her son, the only Engineer in the family, the challenge to come up with a planetarium design. The requirements were simple, to seat at least 30 people, the Planetarium building should be a permanent structure, the planetarium should be operated by employees with limited skills and the whole project budget should not be more than that of 3-bedroom home (R2 000 000) that Marina plans to sell to afford this project. After a year’s feasibility study Nico, her son, came up with a rather bizarre concept. The two main pillars of this design is an affordable housing concept and a state of the art projection system. The affordable housing concepts makes use of an inflatable air support in the shape of a hemisphere that’s inflated and kept at 0.5 Bar. The air support is used as a guide for the bricks, each dome can be built within 3 days. The inflatable air support can be deflated hours after the last brick was laid and then moved to the position of a second dome if required. This concept does not require any I beams or steel support other than a couple if thin rods placed between the two layers of brick. In order for the dome curve (projection screen) to start at a desired 2.2m above ground level a platform was constructed to lift the inflatable air support. This lift made it possible for surround sound speakers as well as acoustic material to be mounted on the circumference of the projection dome wall.

The concept intuitively makes it possible to plaster the inner surface of the brick dome and create a smooth projection surface. Fulldome.Pro's DX4 projection system stood out amongst the 13 systems considered for Sutherland Planetarium. The most attractive features were its ability to adapt to a "rougher" projecton system, its 4 stage auto calibration function and its cost. From changing a projector bulb (which you can do yourself) it only takes 15minutes to do a full Geometry, Black, White and colour calibration. One of the impressive features is the ability to connect any computer to the projection system via a single HDMI cable and using the planetarium screen as if it’s a second larger computer screen. This feature makes it possible for the planetarium operator to use software like Stellarium on the dome screen, which can be run from a simple laptop. The planetarium concept was a huge success and works better than expected. It was built by a small team of builders (none of which ever built a brick dome before), using general building materials all sourced locally. This concept will make it possible to construct planetariums even in remote locations at a fraction of the cost of a conventional digital Planetarium.

The First East Asia Countries Collaboration in Astronomy Outreach during the Pandemic

Chasing a solar eclipse has always been a dream for astronomers. It is a great moment to bring astronomy closer to the public. Numbers of outreach and educational activities increased during solar eclipse within the solar eclipse path. Unfortunately on 21st June 2020, 3 months after the pandemic breakout, most of the region with solar eclipses in East Asia was banned from gathering and everyone was forced to stay at home due to Covid-19 pandemic. Due to covid-19, a new norm was introduced and the internet has become more accessible. In order to share the eclipse excitement to the public during the pandemic. Apadilangit; Universe Awareness Malaysia has organized the first East Asia online Universe Awareness collaboration with Universe Awareness national coordinators and IAU National Outreach Contact within the region. The objective of the collaboration is to enable outreach programs during this pandemic by leveraging on solar eclipse phenomena. It is also to stream the observation experience from the beginning of the eclipse at the west country in East Asia to the ends of the eclipse path at the east country in East Asia. This collaboration also aims to promote diverse cultural beliefs about eclipse around this region. Impact study has been done by Universe Awareness Japan and the result showed it has achieved its objective. This first initiative has expanded the collaboration among the organizers as we collaborated in new moon sightings with Bosscha Observatory, ITB (Institut Teknologi Bandung) and and recently with IETRA (Institut Teknologi Sumatra) for Saturn and Jupiter conjunction.
Virtual game-like immersive online worlds allow us to mitigate constraints associated with commute time, physical space costs and health safety. Thus, it creates a novel opportunity to connect new and old audiences with professional communicators. The challenge is making this connection accessible and meaningful. I will speak from experience and present two of our projects as case studies. One of them is a live show created with JAXA about the Hayabusa2 mission that was implemented as a WEB-based 3D world and was accessible from any device including Virtual Reality headsets. We had live lecturers presenting in front of live audiences from 6 countries (https://www.omniscope.org/virtual-worlds/outreach/). Our second example is a virtual installation we made for Nautilus magazine where we tested how important it is for people to share a virtual space. I will share a bigger picture of the online immersive entertainment. More specifically I will discuss the range of techniques that are used in online productions, like online immersive theaters, for audience engagement. Some of them can be adapted for outreach as well. Finally, I will discuss the technical side of hosting or implementing an online immersive show. I will talk about the technical requirements for the audience members, the limitations, associated costs and other caveats. I will argue that virtual worlds are underused for astronomy outreach and that adopting this media is not as difficult as it may seem. I will invite all interested parties to continue the dialogue after the conference to answer more technical questions and discuss potential collaborations. Also, I will advertise a thematic 2-day workshop that I will organize for the American Astronomical Society later this year.

The year 2019 was very special for astronomy with a number of remarkable events being celebrated worldwide. It marked the 100th anniversary of the historical solar eclipse of 1919 which allowed the verification of the General Theory of Relativity, as well as 50 years since a human being landed on the Moon for the first time. Another important milestone was the 100th anniversary of the International Astronomical Union (IAU100), celebrated with a number of projects and events organized in global, national and regional scales. Among those projects was the IAU100 NameExoWorlds, a truly global initiative where the IAU gave the opportunity to all countries to name a specially assigned exoplanet and its host star as a result of a national public contest. Following the discovery of thousands of exoplanets orbiting other stars, this project aimed to inspire people to recognize Earth as our home among many other planets, and to promote a feeling of global citizenship, while everyone had a chance to be part of the process of naming stars and planets. The project came to an end in December 2019 with the announcement of 110+ pairs of names, all proposed by the general public, an effort that involved over 780,000 people either by sending name proposals or voting for their preferable choices.

National Committees responsible for running the contests at the national level were created in each participating country. Most of the committees were formed using the National Outreach Coordinators (NOCs), under the umbrella of the IAU Office for Astronomy Outreach (IAU OAO). As expected, results show a huge diversity, ranging from names related to indigenous cultures, historical figures, natural wonders, and names associated with the night sky in different languages. This talk will address IAU100 NameExoWorlds as an example of a successful outreach project on a large scale with truly public engagement. Its implementation will be discussed in the light of the essential time investment of the Steering Committee members, most of them committed as volunteers, and of all national volunteer collaborators for the organization of 100+ national contests. Results will be shown to illustrate how the names chosen are diverse and representative of each participating country’s culture.

The #SotonAstroArt (2017-2021) Sci-Art project engaged ~15,270 people with DES/Supernovae research. ~3,750 people took part in arts workshops at arts festivals and libraries (Hands on Humanities Day at the Human Worlds Festival: 2017, 2018, 2019, 2020 and Light Up Poole! Digital Arts Festival (LUP!) 2019, 2020), with a further ~11,490 on-line engagements through activity downloads, video views, unique users to websites and social media use. Audiences included: i) Engagement with Emerging Artists 97 Emerging Artists were given over 2,600 photographic astronomy plates in 2017, creating 87 new artworks. The artworks were exhibited at 5 public engagement events (Human Worlds: 2018, 2019, 2020 and LUP!: 2019, 2020) to ~700 people, and exhibited at a further 9 professional art exhibitions (including: TEDx Whitehall event at The Royal Society, Lumen Residency exhibits in Italy and Open Studios at Dean Clough, Halifax). The artworks and artists comments were analysed, with the artists claiming to have learned new skills, gained knowledge, valued the experience and been inspired by the research processes. ii) Engagement with family groups Families participation in the project led to increased learning about supernovae, Physics and an audience attitude change toward learning about Physics. Approximately 990 artworks were made during 13 #SotonAstroArt workshops on campus, in local art galleries, churches and libraries in response to a narrative about our Supernova research. The contents of 176 drawings produced during two festivals (Hands on Humanities Day 2019 at John Hansard Gallery, Southampton and LUP! in St James Church Hall, Poole) were analysed revealing that 26% included supernovae. As the subject was not taught at primary school, we determined this to be evidence of participants gaining new knowledge. Of the ~2,000 people who attended the Photon Shop at LUP! (2020) 22 people were surveyed representing 84 family members. When asked what they had learned, 31% reported having learned about Supernovae; 40% reported that Supernova activities were their favourite activity in the shop. As a result of the Covid restrictions of interacting with face-to-face the project also achieved the following: Delivery of six online workshops, an on-line amateur artists competition and distribution of 300 supernovae teaching resources in ‘activity packs’ for local Southampton families without internet access. iii) Engagement with on-line audiences On-line audience reach included visitors to websites, blogposts and followers of an on-line art competition. The competition fascinated participants, gave them knowledge about supernovae and motivated them to learn more about the research topic.
Oral Presentation
Felipe Carrelli da Silva and André Fernandes da Paz

Desert Stars: using virtual reality to disseminate the ethnoastronomy of Sahrawi refugees.

This presentation describes the co-creation [1] process of a virtual reality (VR) documentary to register the worldview of Western Saharan refugees living in camps near Tindouf in southwest Algeria since 1975. The initial hypothesis is that VR can be a useful tool to enhance the field of scientific communication [2], particularly ethnoastronomy, the science that studies, through the customs of a people, their astronomical knowledge told through orality [3]. The aim is to approach the scientific knowledge of this population from a decolonial perspective [4], representing refugees from the point of view of their knowledge. This project is part of a master’s degree ongoing at the Postgraduate Program in Creative Media of the Federal University of Rio de Janeiro in partnership with GalileoMobile. Created in 2008, GalileoMobile is an international nonprofit scientific outreach program that brings astronomy to students, teachers and residents of hard-to-reach communities [5]. In 2019, GalileoMobile carried out the Project Amanar, aiming to inspire children and teachers from five Saharawi refugee camps. Amanar was selected in 2019 as “Special Project” in the centenary of the International Astronomical Union (IAU), for being an example of how astronomy can serve to bring encouragement to places in conflict and to foster respect among cultures [6]. Amanar aims to register the Western Saharan refugees’ worldview of the sky for the preservation and dissemination of the memory of this society. In order to do that, the group interviewed four elders of the community to register their knowledge about the sky and the names of stars according to their tradition. During the co-creation process, other demands began to emerge from the interaction with the local community. It became clear that it is important not only to popularize their ethnoastronomy, but also to spread the political issue surrounding the community. Thus, the final VR product will have a collaborative structure. This presentation intends to discuss the possibilities, advantages and limits of this co-creation process in science communication and its implications.

References
Oral presentation
Aime Flood (TCD)

Oral presentation
Dr Sophie Murray (TCD), Prof Peter Gallagher (DIAS)

Astronomical Midlands: Engaging Rural Communities in Ireland with Radio Astronomy

The Astronomical Midlands (Astronlands) programme is based in the Irish Midlands, a region of low uptake of post-secondary education and underrepresentation in STEM fields. Two years ago we started this education and public engagement programme built around the Irish Low Frequency Array (ILofAR; Iofar.ie) radio telescope and the historical Leviathan telescope both located in the midlands region in Birr, County Offaly, Ireland. Having a heritage of world class astronomy research as well as a modern observatory in the local area valuable platforms which allow us to discuss astronomy, space science and more, connecting with students, teachers and members of the public in local, rural communities in the Midlands. Astronlands has three key initiatives: Space4Exploration: Developing an engaging, inspirational, and multi-use exhibition space and the LOFAR Education Centre and engaging the local community with public talks and events on space, astronomy and related topics. Space4Students: Developing and delivering day-long and week-long workshops and space camps at the I-LOFAR Education Centre and online to run during school terms and holidays for students aged 10 to 14. Space4Teachers: Creating and delivering Continuous Professional Development workshops for primary and secondary school teachers based around the Primary Science curriculum and the Irish National Junior Certificate (12-15 year olds) theme of Earth and Space. With these programmes our ambition is to inspire and support teachers, students and the general public to engage with the science, engineering and radio astronomy of the LoFAR. Since launching the Astronlands in 2019 we have achieved significant success with this and are continuously reviewing and improving our offerings. Since going fully online in 2020 we have faced new challenges and began to redesign aspects of the programme to most effectively deliver online events, talks, workshops and training sessions. We will discuss in detail the difficulties and solutions to these and other challenges to help disseminate our experiences to benefit more astronomy communicators and in turn the general public.

Oral presentation
Muhammad Hafiz Ahmat Murtza
Amirul Hazim Kamarulzaman

AstroInclusive Projects to Empower Diversity and Inclusive Malaysian Communities

Diversity and Inclusive people have always been neglected in astronomy. This is due to the lack of awareness programs dedicated to the community. Public support normally focuses on things that help them live independently and peacefully. Thus astronomy topics seem irrelevant in their lives. To help create awareness for diversity and inclusive people in Malaysia, Apadilangit; Universe Awareness Malaysia has established a program called “AstroInclusive.” AstroInclusive focused on diversity and inclusiveness in astronomy. This project was launched to cater all spectrums of inclusivity including hearing and visually impaired kids and adults, non-representative groups such as drug-addicted persons in rehabilitation, and gender issues. Its first project was granted a grant by the IAU Office of Astronomy for Development. IMPACT Dome projects is a collaboration project between Malaysia and Indonesia to develop a miniature sky in the form of a geodesic dome with tactile images. This helps blind and visually impaired people to experience the sky via touching sense. The modular dome has made it easy for logistic and storage purposes. Every single piece of the tactile constellations can be used as separate teaching tools. AstroInclusive also reproduced 4 light sound devices sponsored by the International Science Council Regional Office for Asia and the Pacific (ISC ROAP) to be used during Malaysia Annual Solar Eclipse 2019 in Tanjung Piai. The sound of these amazing devices has been amazed to the public during the blind and visually impaired people during the event. Feedback showed that mothers of blind kids were expected to keep the phenomena using the sound when it was aired on the radio. It also acts as a background sound for the public and creates a whole new experience watching the eclipse. To cater to the non-representative community AstroInclusive has organized a “ Motivation from the sky” event with a drug rehabilitation center. This event is to create awareness of astronomy and to link the motivational message to boost the occupants’ spirits. The wide perspective of astronomy and the universe is the best metaphor to convince us that the universe is there to give us a lesson. Strategic placement of the project also allows AstroInclusive to be part of Apadilangit; Universe Awareness Mars exploration month 2021. Hearing-impaired kids and visually impaired kids, parents, and teachers participate in awareness on Planet Mars and the exploration using an online platform. It is the 1st AstroInclusive online event with the visually and hearing impaired during covid-19. AstroInclusive projects play a big role to close the gap between inclusive, diverse, and public. We embedded planet sign language in our 8 planet song for every astronomy camp we organized. We intend to share our learning, experience, and tips on how to start an inclusive movement in society or as a group to the CAP participants.

Oral presentation
Alexander Kaurov
Vyacheslav Bazhenov, Mark SubbaRa

Planetarium Commute Accessibility (case of the United States of America)

Submitted to the CAPjournal pre-print: https://doi.org/10.22541/au.159724581.14747461 The COVID-19 global pandemic unprecedentedly disturbed the education system in the United States and lead to the closure of all planetariums that were providing immersive science communication. This situation motivates us to examine how accessible the planetarium facilities were before the pandemic. We investigate the most important socioeconomic and geographical factors that affect the planetarium accessibility using the U.S. Census Bureau data and the commute time to the nearest planetarium for each ZIP Code Tabulated Area. We show the magnitude of the effect of permanent closure of a fraction of planetariums. Our study can be informative for strategizing the pandemic response.

Oral presentation
Avivah Yamani
Prayudi Utomo, Wicak Soegijoko

Search Engine Optimisation for a purposeful ‘Communicate Astronomy with the Public’ site

In the era of digital journalism and especially in this time of pandemic, online media holds an important role to communicate astronomy. The internet has become essential for education and therefore increased the need for trustworthy news and educational resources in astronomy. As one of astronomy online media in Indonesia, Langitselatan also plays important roles to provide trustworthy resources for the public. But with the increasing numbers of misinformation and clickbait news as well as the need of educational resources for online school, we need to improve the search engine optimisation to reach a wider audience. Search Engine Optimisation is an important means to increase website visibility for relevant search. SEO is also important in communicating science with the public. Based on statistics, Langitselatan received 82% of its visitors through organic search traffic and the pageview increased by the time misinformation became viral in Indonesia. The statistics also showed a significant increase in pageview during the time of pandemic for the basic astronomy topic with Google Classroom as referral. Despite thousands of pagewviews and visitors per day, Langitselatan needs to increase its online presence because based on HubSpot’s, 75% of users never scroll past the first page of search results. By having langitselatan on the first page of the search engine, it will not only increase the website visibility for the public but also direct the public from clickbait content that is widely spread on the internet to langitselatan content. In this paper we will examine the use of SEO and how it can be essential for astronomy communication, how to measure the impact by evaluating before and after the implementation of SEO writing into langitselatan articles and social media posts.
Oral presentation

Jacinta Delhaize

Daniel Cunnam

The Cosmic Savannah: Bringing African astronomy to the forefront

The Cosmic Savannah is an exciting new podcast highlighting the internationally-renowned astronomy and astrophysics coming out of the African continent. Africa has long been an underdog in the world of astronomy, but it is now emerging as a world-leader. Africa has an all-too-rare commodity; vast areas of pristine dark skies and radio-quiet zones. This is why South Africa hosts the largest optical telescope in the Southern Hemisphere (SALT) and one of the world’s most powerful radio telescopes (MeerKAT). Soon, it will also host a large part of the almighty Square Kilometre Array. Not only will these telescopes revolutionise our understanding of the Universe, but they can also be leveraged to significantly improve society. This can only come about, however, if the existence of these telescopes and their discoveries is effectively communicated with a wide-spread public. The Cosmic Savannah was created to help facilitate this communication. Released once a fortnight, the episodes introduce the public to the telescopes, instrumentation, researchers, discoveries and public engagement efforts coming out of the African continent. In particular, we regularly feature a diverse range of young African astronomers who can serve as role models for the next generation. We will demonstrate how we are fighting the somewhat pessimistic impression of Africa as the “dark continent” by demonstrating that this can be leveraged into something that all the people of Africa, and the world, can be intensely proud of. We will also describe how we use our platform to foster an appreciation for the scientific method, critical thinking, general scientific literacy and environmental conservation.

Oral presentation

Beatriz Garcia

Ana Basset, Néstor Camino, Marıa Corti, Mara Olavegogaescoc hea, Santiago Padronantoni, Susana Ramos, Martinucci

A collaborative program for the 2020 great Total Solar Eclipse in Argentina

The great eclipse of December 14th, 2020 was an opportunity to have evidences about the effectiveness of the work performed along several years in education and outreach of Astronomy in Argentina. In this sense a cooperative work was performed in order to face an spectacular event in the middle of probable one f the worst years for an activity as the astronomy for the public, where the activities imply a close contact between the public and the scientists. This contribution shows several different but coordinated actions to assure the success of the activities connected with the eclipse, which also included the online transmission of the event for a world in quarantine. Hundred of virtual meetings and broadcasts transmissions from all the planet, trainin teachers and training citizens workshops, conferences, production of special materials, brochures, contests were proposed, and distribution of material to observe the eclipse, such as certified glasses or pinhole cameras, and inclusive tools such as tactile materials and LightSound detectors, were distributed to more that a hundred thousand people along the totality path and beyond. In this contribution, we present the successes connected with this special program for the eclipse, but also the failures, which teach us what to improve for the next event, probably the December 4th 2021 eclipse in Antarctica, a new and real challenge for the Argumentian communicators of science.

Oral presentation

Callum Griffiths

Pedro Russo

Astronomy and Space Science Communication by Space Industry

At the Astronomy & Society Group of Leiden University we are interested in bridging the gap between experts and the general public. The team largely focuses on space science, but are more than willing to branch out into other scientific disciplines, particularly where there is overlap with astronomy. The situation with the space industry is curious, in that astronomy is but a small part of a much larger industry. From a communication standpoint, it seems appropriate to lean into this public perception and encourage collaboration between astronomy and space science institutions for the benefit of both fields and their agendas, as well as the public who are interested in the achievements of each. The state of the space industry in the Netherlands is reflective of the rapidly-growing global picture. Increasing digitization, along with the floods of data flowing out of the Internet of Things, presents great opportunities for space companies to take advantage of falling prices and miniaturization in satellite technology. This allows small companies to overcome barriers to entry and make entry into space-related markets. The availability of data service providers prosper. The Dutch space cluster is made up largely of high-tech Small- & Medium Enterprises (SMEs) either in data services or as part of the international production line for intergovernmental agency projects, such as launchers and satellites. However, despite the growth of this emerging market and the significant government funding they have access to, little is known about the public engagement practices of these companies. For this research we are conducting interviews with dozens of the CEOs and Managing Directors of the 70+ space companies currently operating in the Netherlands. These interviews uncover the nature and frequency of public engagement activities that these companies involve themselves with. They also expose their motivations for communicating their science, as well as the barriers that prevent them from doing more. In this oral presentation we will unpack the results of this study, and map out the public engagement landscape of this industry. With this knowledge we can begin to sign post a route for astronomy communicators to collaborate with the space industry. At the end of this presentation we will attempt to rouse the years of astronomy communication expertise in the audience to discuss ideas on how the community could turn astronomy communication successes towards the space industry.

Oral presentation

Eva-Maria Ahrer

Melanie Archipley, Hannah Bagdush, Daniel Mortimer

Redefining astronomy summer camps in the age of the pandemic: a break from the IAYC’s 50-year history

The International Astronomical Youth Camp (IAYC) is a three week long summer camp, where around 65 participants aged 16-24 work on independent research led astronomy based projects. The IAYC is organised by the International Workshop for Astronomy (IWA) and its missions are to spread astronomical knowledge and to teach young people to work independently on scientific projects, while promoting international collaboration. Unfortunately, due to the ongoing COVID-19 pandemic, the 2020 and 2021 installments of the IAYC had to be cancelled, a first in the camp’s history. A new online format had to be established dubbed the eIAYC. A group of IWA members, the leader team of the eIAYC, decided on three types of activities to occur throughout the summer months as part of the eIAYC: (1) an engagement series which included a combination of astronomical talks and workshops every few weekends; (2) small independent projects, where a subsection of the leader team provided short projects for the participants to work on over a few weeks and give them an opportunity to present their work in the form of short reports or electronic posters; (3) a non-astronomical program (NAP), where the participants take part in social activities to encourage international communication and cultural exchange. The eIAYC 2020 ran from the 16th of June until the 30th of August with a total of 63 participants. Everyday communication throughout the eIAYC was done using a Discord server, while weekly updates and schedules were also sent via email. In this talk we present our experience of taking the format of a three week long in person summer camp and developing an online alternative to stay in touch with our wide community and keep up our outreach activities during the ongoing COVID-19 pandemic. Moreover we want to highlight organisational challenges and our experiences when it comes to online engagement, in particular given that the participants come from a wide range of academic and cultural backgrounds. We will also talk about the lessons learned and how they informed our plans for this year’s eIAYC. Finally we would like to speak about the impact of COVID-19 on IWA, a non-profit organisation, both on its organisational structure as well as on its financial situation, and how it will affect the way we operate in the future.
Oral presentation
Sarah Burcher
Using Videoastronomy to Engage a Global Audience

On March 13th 2020, Lowell Observatory closed its doors to the public due to the COVID-19 pandemic. While our mission of conducting astronomical research was relatively unhindered, our second mission of conveying astronomy to the general public came to a grinding halt. As guests could no longer access our campus to learn from our educators, we strove to find ways to reach the public in their own homes. We created a wide variety of online programmes, including a series entitled “Interactive Stargazing” which utilizes our videoastronomy system to broadcast live, full-color images from our telescope. Using YouTube’s chat function, we are able to interact with our viewers. They can request objects to view, and ask us questions about astronomy. 

To date, Interactive Stargazing has garnered over 30,000 views on YouTube, not including special event streams, such as one on December 21st 2020 featuring the Great Conjunction of Jupiter and Saturn, which brought in 2.2 million views. We use this platform to educate the public on the “Big Ideas” of astronomy. Using live images of stellar nurseries, planetary nebulae, and supernova remnants, we can bring our audience through the entire life-cycle of a star. Using views of a variety of galaxies, we can illustrate our own Milky Way and describe our place within it.

Many observatories and astronomers have launched online observing sessions in response to the pandemic; we believe ours is currently the only model that allows viewers to interact directly with the host and telescope operator. This has been extremely successful – audiences feel a sense of connection to our stream, to the object on the screen, and thus to astronomy itself. We are happy to comply with even simple requests such as “I would like to see a star please” – we know that our audience is diverse and use these opportunities to explore the foundations of astronomy and basic concepts like star color and temperature. Our videoastronomy system is ideal for this – our 14” PlaneWave CDK equipped with a MallinCamUSBTEC allows us to take full-color images of most deep sky objects in less than thirty seconds. We are able to always keep a “live” image on screen, and our mount can switch objects almost instantaneously. This allows us to maintain a constant level of interaction and entertainment for viewers by minimizing downtime. In this presentation, we will explore not only Lowell Observatory’s equipment and engagement model, but discuss how others may begin their own videoastronomy programmes.

Oral presentation
Izumi Hansen
What People Want to Know about Astronomy — Letters to the International Astronomical Union

The Office for Astronomy Outreach, a joint office between the International Astronomical Union (IAU) and National Astronomical Observatory of Japan (NAOJ), handles messages from the public to the largest international union of astronomers every day. Tasked with promoting and safeguarding the science of astronomy, the IAU receives 200+ inquiries yearly from the curious to the combative on a wide range of astronomical topics. These questions offer a broad view of the interests people have in astronomy as well as insights into their motivations for contacting the IAU and the public’s understanding of the administration of astronomical science, all of which gives hints at the gaps in knowledge among the global public. This presentation will review the most common topics received from the public and provide an analysis of some messages to show what may motivate them to contact the IAU. We’ll also show the multiple channels we have to address these enquiries and suggestions for astronomy communicators to incorporate these answers into their work.

Oral presentation
Shivani Pethe
Yoga with the Stars

This project attempts to get children (and grownups too) to find a connection between themselves and the sky while indulging in a healthy Yoga routine. The pandemic has put our physical and mental health at risk. Practising Yoga allows us to give our body and mind the attention it needs, supporting our entire wellbeing. Moreover, it is not so difficult to share in virtual communities. Yoga for kids can be different from Yoga for adults though, and a yoga teacher needs to create stories to engage the attention of children and keep them continuing this beneficial practice. One can draw a parallel to an astronomy communicator who would naturally choose to tell stories based on the mythology in the sky. The idea behind “Yoga with the Stars” combines these and narrates stories of the sky via Yoga poses and then gets the audience to follow up with observing activities with the real sky constellations. Currently this is an online project, with a new Yoga story and some sky activity videos released every week. A set of full-body (and mind) activities is being designed that take children through a connected set of Yoga poses related to some characters, objects, animals, environment, etc., featuring in one sky related story at a time. At this stage, stories with asterisms (i.e. various “nakshatra”) and constellations appearing in Indian and Greek sky lores are featured. Our team’s certified yoga expert (and astronomer) verifies and adapts poses to make them child friendly. This indulgent storytelling is followed up by another session, with the educator talking about the same constellation from the Astronomy perspective and taking up activities with sky maps, DIY planetarium etc. helping create further curiosity towards the sky. For the evening, the children are asked to identify the area in the night sky where the story takes place. To maintain a continuity in exercise, the 10-minute Yoga routine is prescribed to be repeated every alternate day. A new story appears every fortnight or so, taking into account what is visible in the sky. We will report the progress of the initial phase of this activity done with groups of children of age 10 - 12 years, but of course anyone can take part in it. Children could also involve their family/ friends to do it together with. The content will be accessible to all, even to teachers in remote places with some internet access. Activity literature will be shared along with the videos so that the teachers can themselves learn and safely conduct the hands-on sessions with their students. The project has scope for expansion, by including stories from other cultures to develop an appreciation of them. Additionally we could discuss light pollution by connecting the children’s observations to citizen science projects like Globe at Night. Children who experience this Audio-Visual-Kinesthetic activity may thus become good ambassadors of both astronomy and good health of the body and mind.
Oral presentation
Emmanouil Chaniotakis
Dr. Sofoklis Sotiriou, Panagiota Tsoumakis, Georgios thanasopoulos
Communicating Astronomy in the Covid19 era with the Ellinogermaniki Agogi school observatory
For the past 14 years, the Ellinogermaniki Agogi school in Greece (EA) is operating a fully equipped School Observatory in its premises which is very active in the organization of education and outreach activities for teachers, students and general public. Due to the Sars-CoV2 pandemic, the EA observatory team shifted its activities to online, designing a series of events with virtual presence or limited physical participation (small groups of 5 students maximum) to support the educational and outreach programme of the observatory. Students were introduced to the process of astrophotography and were asked to act as hosts in a series of presentations delivering distance lessons on astrophotography. Additionally, the observatory team took advantage of a series of unique astronomical phenomena, e.g., the great conjunction at the end of December, to disseminate the online events to a wider public. The observatory programme included live public broadcasts dedicated to the observation and photography of Jupiter, Saturn and Mars; the observation of major astronomical events such as the great conjunction of Jupiter and Saturn from both North and South hemispheres; milestones in space exploration such as the landing of the Perseverance rover on Mars; historical scientific experiments and observations relevant to astronomy such as the Eratosthenes experiment as well as live broadcasts of presentations by invited speakers on various astronomical topics and virtual visits to other observatories, such as the Sskinakas observatory in Crete and the Boyden Observatory in South Africa. These activities, engaged more than 5000 students and more than 50000 citizens. The events were focusing a dialogue between the members of the observation team, by creating a representation of the interaction between the expert and the participant. Questions and comments from the live broadcast channel were feeding the discussion. The events were organized at three levels of participation, a small group with physical presence, a bigger group that was connected in a zoom channel with direct access to observation team, while the event was transmitted to the YouTube channel of the observatory. Visitors had the chance to follow the observation process step by step, the preparation of the telescope, the mounting of the infrastructure, the images processing and production as well as to have a direct interaction with the students and the observatory team. A series of validation and assessment tools were used to monitor virtual visitors interest, motivation and behavior during and after the EA observatory events. Data demonstrate the there was a significant increase on interest and motivation while the visitors’ participation rate demonstrates that the impact of the designed activities was significant.

Oral presentation
Stefania Varano
Caterina Boccatto, Sara Ricciardi, Stefano Sandrelli, Rachele Tonio
Game-Based Learning and Astrophysics: a case study
The National Institute of Astrophysics has developed since many years several activities based on playful environments and materials. This activities adhere to the game-based learning, an educational approach that makes use of games as learning and skills-improvement tools, both in formal (schools), non-formal (museums) or informal (daily life) context. Game-based learning is really powerful and can be intensively used in astronomy education and outreach, especially when the aim is creating familiarity with the scientific method, improving problem solving and soft skills in general and recognizing the utility and value of mistakes. The effect and validity of already available game-based learning activities produced by INAF has been studied within the work for a M.Sc. Thesis. In this framework, a set of evaluating parameters and criteria was developed for assessing the achievement of disciplinary and educational objectives. In this work, a specific game-based activity has been analysed, "Talking about resolution", presented at CAP2018. The game involves the use pegs of different dimensions, aiming at making children experience and learn the basics of resolution of digital images. Resolution is a key element in astronomy and many of its related concepts are very intuitive and related to daily life experience, which makes it perfect as the central topic for a game-based learning activity. The activity has been studied both describing its design process and evaluating its effectiveness as application of the game-based learning approach. The evaluation was carried both on the basis of the results of field testing and through the application of the theoretical, cognitive and pedagogical background of game science. Besides, within the framework of the collaboration between INAF and the new born Game Science Research Centre @ IMT School for advanced Studies in Lucca, Italy, we have started designing a board game basing on the laboratory "Talkin’ about resolution". The idea is to create a self-supporting game with an abstract and/or an astrophysical setting based upon the digital resolution of images, to produce and distribute it with the INAF brand. We will present here the theoretical framework of the game-based learning educational approach, the evaluation of INAF educational activities analysed within this study, in particular the lab "Talkin’ about resolution", and finally the design process of the board game based upon that concept.

Oral presentation
Masaaki Hiramatsu (National Astronomical Observatory of Japan)
S_Asagiri and Stella. G. Amano on behalf of the Virtual Space Program, Naohiro Takanashi (The University of Tokyo), Shio Kawagoe (The University of Tokyo), Kazuhsa Kamegai (National Astronomical Observatory of Japan)
Virtual ALMA Tour in VRChat – Immersive Experience in a User-Generated World
We present a pioneering astronomy outreach in a virtual reality social platform VRChat. Many forefront observatories are located in remote areas and are difficult to visit, and the global pandemic made it even harder. Several virtual tours have been executed on YouTube/Facebook live, however, it is difficult to get a sense of immersion and they are far from actual experiences on site. To provide an experience similar to visiting the sites, we performed a virtual ALMA observatory tour in VRChat. The high-quality virtual antenna array of ALMA was produced by S_Asagiri mainly based on the photographs of the antennas. The virtual tour was organized by a group of astronomy/space fans called “Virtual Space Program (VSP)” of which S_Asagiri is a member. Masaaki Hiramatsu, the East Asian ALMA Education and Public Outreach Officer guided 39 guests in the virtual tour and explained the technical specifications of the array and antennas, along with the basics of radio astronomy. Among 38 guests who responded to the post-event survey, 21 were in their 20s and 9 were in their 30s, indicating that this event mainly appealed to younger people. 22 out of 37 have heard of ALMA prior to this event, which means that even if they didn’t necessarily have a deep interest in astronomy, they were interested in the VR environment and participated. The survey shows that 28 out of 38 positively evaluated that they had bidirectional communication with the guide. Respondents answered that the communication was more intensive than in other online outreach events and on-site public talks. 34 answered that their interest in astronomy increased by the tour. Notable entries in the free description section include “there are many aspects that I can feel as my own experience,” “The close proximity to the lecturer and the ability to listen to the lecture while looking at the near-real antennas up close gave me a more realistic sense of being in a face-to-face lecture than I expected, even through an avatar.” The tour guide also felt as if he was explaining to the visitors on site, which made it easier for him to explain the features of ALMA and facilitate the question and answer session. The responses show that VRChat is a very effective means for astronomy communication in the new normal era.
<table>
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<tr>
<th>Oral presentation</th>
<th>Bethany Downer, Jorge Rivero Gonzalez, Pedro Russo</th>
<th>A Global Framework for the Effective Coordination of 4 IAU100 Global Astronomy Outreach Projects</th>
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<td>The IAU organized a year-long celebration in 2019 called IAU100 to increase awareness of a century of astronomical discoveries as well as to support and improve the use of astronomy as a tool for education, development and diplomacy under the central theme &quot;Under One Sky&quot;. IAU100 has implemented modern, effective and innovative means of public outreach for astronomy engagement activities conducted at large scales, including nationally and globally. This presentation will discuss a common framework that was developed for the organization and implementation of four IAU100 global outreach projects conducted in 2019 and early 2020. The IAU100 Secretariat developed an exciting programme of 11 IAU100 Global projects that covered the goals of the initiative and were each implemented and disseminated by the IAU100 National Committees in their respective countries. Amongst these, there were four global projects that sought to encourage the engagement of the public in the celebration of astronomy and IAU100 under various themes. The first of these was the ‘100 Hours of Astronomy’ event, which took place from 10-13 January 2019, during which over 1200 astronomy-related outreach and education events took place simultaneously around the world in 86 countries. In July 2019, the IAU100’s celebration of the 50th anniversary of the 1969 moon landing took place under the title ‘Moon Landing 50’. This was the largest coordinated Moon landing anniversary action worldwide with more than 130 countries celebrating the historic milestone and over 1.2 million event attendees. In November 2019, the Astronomy Day in Schools initiative saw participation in 70 countries and over 500 astronomy activities conducted in schools by local astronomers and scientists, collectively engaging over 110,000 students globally. In February 2020, the final IAU100 global project ‘Pale Blue Dot: Astronomy for Global Citizenship and Environmental Awareness’ celebrated the 30th anniversary of the iconic image and stimulated important discussions on the relationship between astronomy and global citizenship. This project consisted of over 500 events in 59 countries worldwide. Discussions will include how to coordinate a global astronomy outreach event on a global scale by exploring the common framework used for the above global projects. The coordination framework’s actions includes a project website, outreach and social media strategy, communications with event organizers, contests and prizes, the dissemination of resources and activities, translations, image collection, and reporting. Particular emphasis will be made on how matters of diversity, equity and inclusion were considered and implemented on a global scale for these four outreach initiatives, and the importance of astronomy resources and activities localization. Finally, a review of the lessons learned and reflections of effective actions by the IAU100 Secretariat will be provided.</td>
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<td>Oral presentation</td>
<td>William Saunders, Malena Rice, Alex Gagliano</td>
<td>Astro(sound)bites: A new audio resource for conveying recent astronomy research</td>
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<td>Astro(sound)bites is an astronomy podcast hosted by three graduate students, designed to communicate recent research results to early-career scientists and the general public in an engaging and accessible manner. Inspired by the popular Astrobites research blog, astro(sound)bites explores the methods and findings of research papers and synthesizes them in the context of ongoing research in the field. Each episode centers around a theme, and the podcast regularly employs interviews with early-career academics. Occasional “beyond” episodes, in the style of Astrobites, tackle additional topics in academia such as representation in astronomy and atypical career paths. Over 28 episodes have been published across multiple platforms, totalling 5700+ downloads from six continents. Because astronomy is often conveyed visually, astro(sound)bites provides a crucial resource for auditory STEM learning that is freely accessible around the world. In this talk, we will introduce the astro(sound)bites podcast, discuss our current listener base, and outline the ways that we are expanding this initiative.</td>
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<td>Oral presentation</td>
<td>Peter Michaud, Lars Lindberg-Christensen</td>
<td>Communications Best Practices in the Era of Multi-Messenger and Time-Domain Astronomy</td>
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<td>Gemini in the Era of Multi-Messenger Astronomy (GEMMA) is a project funded by the US National Science Foundation. GEMMA is a major initiative to develop sophisticated instrumentation and infrastructure for the international Gemini Observatory (a Program of the NSF’s NOIRLab) in support of Multi-Messenger and Time-Domain Astronomy (MMA/TDA) research. Additionally, the grant provides support for the development of resources and materials for advancing communication and education in the era of MMA/TDA. In this presentation, I will present an overview of the GEMMA communications and education initiatives which include: internships, planetarium programming, a media workshop held during the January 2021 AAS meeting, and a hugely successful MMA/TDA Communications Summit engaging over 30 astronomy communication professionals. The MMA/TDA Communications Summit, held in November 2019, resulted in the development of a MMA/TDA Communications Best Practices White Paper which I will summarize along with a look at the future in the era of the Rubin Observatory.</td>
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**Organized live broadcasts accessible to deaf, blind and visually impaired people**

Among the astronomy dissemination activities, the most penalized by Covid restrictions are those which were based on the physical interaction with participants to ensure the complete accessibility and inclusivity. The need to reshape these activities and try to make any type of on-line event accessible to people with sensory disabilities has been addressed in this work. This objective presupposes the need to integrate in the same live broadcast non only the audio/video sources of the active participants and a shared screen but also a clearly visible window with the signed language interpreter and live generated captions. Considering the extensive use of mobile devices, careful use of the video spaces must be made to ensure the comfortable readability of all elements even to visually impaired people. Despite the only apparent complexity of managing a so structured live event, we identified simple solutions, which can be implemented by anyone, without any professional equipment, only using completely freeware software. The best solution identified, mainly based on the simultaneous use of Skype, Open Broadcaster Software® and WebCaptioner, will be shown and the software and hardware tools detailed. In particular, the identified configuration was tested in the 2 hours long live broadcast of the landing of the NASA Perseverance rover on Mars. It is worth noting that, for this kind of events, not only the technical aspects must be carefully evaluated but also the preparation of all the guests, and that of the sign language interpreter, must be faced well in advance. A group made up of deaf amateur astronomers (one of whom is deaf-visually impaired), Italian Sign Language (LIS) interpreter and linguistic experts from the Italian “Consiglio Nazionale delle Ricerche” (CNR), worked in close collaboration to define: the specific LIS lexicon relating to new and missing astronomical terms; the LIS translations of some pre-recorded parts (Dante’s triplets); the rendering in LIS of tonal and prosodic aspects, working on the strategies of this language (e.g. impersonation technique); the best visual rendering of the video (i.e. contrast between background and body/hands of the signer) for accessibility by the deaf-visually impaired people. Methodological insights will be provided. This first fully accessible live commentary of a planetary exploration mission collected a large interest in both the deaf and blind Italian community with more than 700 simultaneous connections and more than 10k views reached in few hours. The positive and negative aspects identified in this broadcast will then be discussed to provide the attendees with useful and tested good practices. The result obtained shows how with very few resources it is possible to achieve the idea of a fully accessible on-line event. The work presented stems from the collaboration of the Italian Amateur Astronomers Union (UAI) with the Language and Communication Across Modalities (LaCAM) laboratory of CNR.

**A4BD: Astronomy outreach software for the visually impaired and the disabled**

This work describes the outputs of A4BD, an Erasmus+ project that aimed to develop a database of astronomical objects and special software to enable the visually impaired and the disabled to get in touch with the science of astronomy. The database developed includes photographs of astronomical objects and special software to enable the visually impaired. The software for aural interpretation of astronomical images translates astronomical images into audible sounds in order for individuals who are vision impaired to be able to both understand and enjoy the science of astronomy. This involves recognition of basic parameters of the astronomical objects of interest in the picture, separation from background sky and detection of their shape and color. The analyzed images are translated into audible sounds that corresponds to the visual information detected incorporating the three basic elements of human sounds perception that is pitch (related to frequency), loudness (related to intensity) and timbre (related to the qualitative elements of the sounds). The software translates color based on the sonochromatic scale and uses volume to represent the concept of brightness. Object outlines are communicated by using vibration when the user touches the outlines. The implementation of the software was performed using the Unity framework and has been built as an Android application usable by all smartphones and tablets. Users can use voice commands to navigate the application menus. The sounds interpreting astronomy photos are generated while the users touch the objects in the screen, moving their finger across the screen. In order to also care for people with other disabilities, we also developed a software link between remote observatories and the applications. We provide a module by which users can upload photos to the application web server and these are available as extra photos on the A4BD application. For those not having the ability to access an observatory, our observatory, located in Patras, Greece, can be operational at any time. A form for anyone to be able to request an image or book an appointment is available in the project website.
**Oral presentation**

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<tr>
<th>Annette S. Lee</th>
<th>Puragra Guhathakurta, Kate Rosok, Tavia La Follette</th>
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<td>&quot;Native Skywatchers &amp; Starr, Starry Nights - An Interdisciplinary, Indigenous, Community-Based Collaboration During Covid-19 and Beyond&quot;</td>
<td>Social Media Popularizing Astronomy to Solar System in times of a pandemic</td>
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During this time of global hardship caused by the covid-19 pandemic, where unsustainable systems are being uncovered and amplified, there are silver linings. Ground-based telescopic observatories are closed. And yet, remote work allows opportunity. New ways to communicate astronomy with the public are being forged. Building on the existing Native Skywatchers research and programming initiative in a unique merger with the Starry, Starry Night program (UC-Santa Cruz), this project gives students and educators a rare and innovative engagement opportunity, to drop in on a live telescopic observing session and wrap their brains around cutting edge research related to: the fate of the Sun, stars pulsing like a heartbeat, merging ultra-diffuse galaxies, and the amount of dark matter in our galaxy. Designed by Lee (2007), the Native Skywatchers initiative seeks to remember and revitalize indigenous star and earth knowledge. The overarching goal of Native Skywatchers is to communicate the knowledge that indigenous people traditionally practiced a sustainable way of living and sustainable engineering through a living and participatory relationship with the above and below, sky and earth. Starr, Starry Night (2021), is an initiative that gives students and teachers access to real-time observations with the Keck 10-m telescope on Mauna Kea on the Big Island of Hawai`i and the Lick Observatory’s Shane 3-m telescope on Mount Hamilton in California. The aim is to encourage and enable a larger fraction of Indigenous youth and their educators to participate first hand in science. Now is the time to bring our ingenuity to bear on educational models that bring more students into STEM. The key to the innovation in communicating science is acknowledging that culture and worldview play an essential role in learning STEM (Kawagley and Barnhardt 1998, Lee 2020; O’Donnell, Prather, and Behrozzi 2020; Canning et al. 2019; Freeman et al. 2014; Hawkins and Vera 2021). As we acknowledge the role that culture plays in learning STEM, we must also acknowledge story as narrative pedagogy. As we acknowledge the role that storytelling has played in Indigenous cultures throughout time, past and present, we elevate not only the Indigenous voice, but also Indigenous methodology as a powerful tool of inclusive teaching and learning STEM. Presented here are the preliminary results of a project entitled, "Native Skywatchers-Starry, Starry Night". We bring together Western and Indigenous science in the context of the theme, "We Are Star Dust", to inspire students’ curiosity, to ignite their motivation, and to create a supportive learning space so they can tell their story of relationship to sky. Our effort uniquely creates experiences for students of color by centering Indigenous knowledge, people, place, and pedagogy so that they do not have to sacrifice their cultural identity in order to participate fully in STEM.

**Oral presentation**

| Catarina Leote Sérgio Pereira, João Retrê, Tavia La Follette | A board game about the Solar System in times of a pandemic |

Analysing school curricula until 7th grade (13 years old), we concluded that, at least in Portugal, there is a limited coverage of Astronomy subjects. This situation is also often accompanied by limited primary school teacher training and resource availability. In addition, some astronomy concepts require a level of abstract thinking that might be discouraging for some children. The end result? Some children will have a low interest in Astronomy, not only because of their personal preferences but due to low exposure or a negative perception towards it. To help overcome this, the Science Communication Group of Instituto de Astrofísica e Ciências do Espaço developed a board game about the Solar System, aimed at children from 6 to 12 years old, and adapted to both formal and informal educational contexts. Opting for a board game instead of a digital platform, we made the conscious decision of valuing the power of storytelling and social interaction as engaging and focus-promoting learning strategies, unlike the information and stimuli overload sometimes present in digital environments. Starting from a more familiar perspective, biology, as children of this age group will be familiar with "animals", we made a leap forward towards astrobiology, and used imaginary aliens as a "hook" to explore the characteristics of the main Solar System bodies. The development of the game led to many challenges, from defining the level of complexity and keeping it engaging, to the adventure of "creating" aliens physiologically adapted to different planets and moons of the Solar System. The game is now entering its final stages of production, and will soon be made available online in a "Print and Play" version. In our presentation, we will share the premises and goals of our game, the development process, the challenges found along the way and the lessons learned. Strategies to cope with the "new normality" imposed by Covid-19, while advancing the project, will also be presented.

**Oral presentation**

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<th>Nurul Syahirah Binti Nazarudin</th>
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<td>Interpreting and Popularizing Astronomy to the Public through Arts in Social Media</td>
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Connecting Astronomy to the individuals who are not involved professionally with the field is truly a challenge, especially adults. Nowadays astronomy is perceived to be an exclusive field of knowledge which only studied by professional astronomers and enjoyed by amateur astronomers. As Astronomy progresses, so does its distance with the society. To bridge astronomy with the public, we must present astronomy in an eye-catching and approachable way. The method is to interpret and popularize Astronomy through work of arts in social media. Based on what I have accomplished as a space artist and a science communicator, I express the astronomical subject through work of arts and explain the science behind my artworks. In communicating Astronomy through artistic works and making it comprehensible for the public, it is important for the artist to produce arts that are meaningful and contain scientific explanation behind them. Astronomy provide a deeper meaning to the artistic work and help the viewer to relate themselves with the universe in a more “human” way. The existence of social media enhances our opportunity to share the information and news about astronomy. During the pandemic outbreak, humanity has been keeping in touch with each other through the virtual social platform. Art and social media have one thing in common that will assist public engagement with Astronomy; it connects people with the information. Art carries the knowledge in a creative, conspicuous, and stimulating way meanwhile social media platforms spread the knowledge and making it reachable to the public. By utilizing the social media in communicating Astronomy through artistic works, the work of cosmic arts can be spread across the globe and thus popularizing Astronomy in different field. By popularizing astronomy through arts in social media, I received a lot of respond in interest, especially among adults who wanted to know more about the message and science behind the artworks. They were curious about an artist’s perspective in Astronomy. This also proved that they could pursue their passion in astronomy through any forms and fields. I was invited for talks and live painting sessions while explaining the science behind my arts virtually through social media, which gained attention from local to international audiences. Through this effort, the astronomers and artists can work side-by-side to deliver knowledge in such a way which enticed the public to get to know more about our universe. With the world within our fingertips, Astronomy can be ubiquitous in its most attractive form and significant to the public. Through arts, we are humanizing astronomy by interpreting it in humanly perspective to make it relevant to others and social media became the platform to connect and popularize these artistic interpretations of our universe, making it reachable across the globe.
| Oral presentation | Richard Hechter | One night at Poker Flat: Equivoque and the magic of ethnoastronomy | As dusk approached, over 800 local adults and children lined up outside the locked gates of the Poker Flat Rocket Range located just outside Fairbanks, Alaska. The queue that meandered along the shoulder of the mountainous highway formed for entrance to tour the facility and learn from various invited speakers and exhibits in celebration of its 60th anniversary. Having been invited to engage with the curious public in a "Star Show", I was stationed upstairs in the T. Neil Davis Science Operations Center in a windowless room to maximize the contrast of the celestial imagery projected on the digital screen. Calling it a "show" was a bit misleading as it was really an interactive talk and with a purposeful exhibit designed for public outreach where people could learn, ask questions, and safely see new perspectives of the sky through a lens of diversity and inclusion through astronomy education and communication. Together, we travelled virtually through time and place to explore the night sky focussing on star formations. At each stop, arrived by changing viewing perspectives using the free Stellarium software, I shared some of the known cultural stories affiliated with the constellations illuminated on the screen. Through an equivoque approach, I steered people towards three guiding tenets: 1) the sky belongs to everyone - regardless of where we are from and how we identify; 2) resonance with the sky can be meaningful and personal, and the depth of that resonance is subjective; and 3) people coming together under the awe and wonder of the sky can elicit empathy for others. This presentation shares stories from that night, rooted in the questions, inquiries, and thoughts of the visitors to my exhibit. Further, I will articulate how those moments prompted rich and deep conversations about astronomy’s potential to help make the world a better place for all. |
| Oral presentation | Marcelo de Oliveira Souza (UENF and CALC) Róbson Vasconcelos Chagas (IFF and CALC), Késia de Oliveira Barbosa (IFF and CALC), Hélia Honório Dutra (CALC) and Edna Valéria Moreira de Oliveira Barbosa (Faculdade Unida and CALC) | AstroCinema: Astronomy in a Drive-In Cinema, an experience of Astronomy teaching and popularization during the pandemic period. | Due to the pandemic caused by the covid-19, we have been experiencing difficult times in Brazil since March 2020. We had a long lockdown in 2020 and we are having a new period of lockdown in the end of March and begin of April 2021. Even with the difficulties we had the opportunity to organize safe events for the public. These were unique and unprecedented events of teaching and popularization of Astronomy to the public. We organized five Editions of a Drive in Cinema to teach and popularize Astronomy. The public participate from their cars. We editions of the AstroCinema in two Brazilian cities: Campos dos Goytacazes and São João da Barra. During the event, images and videos of the Moon and visible planets were projected. Legends about the Moon were also presented. One of the highlights of the event was the live projection of images of the Moon and planets obtained by telescopes. In 2020, four editions of AstroCinema were organized, one of these editions held in July took place in the attached area of a Museum and the other three events took place in September in the parking of the largest Shopping Center of the city of Campos dos Goytacazes. In the events held in 2020, the Moon and the planets Jupiter and Saturn were observed. In January 2021, a new edition of the Drive In of Astronomy was held at Espaço da Ciência of the city of São João da Barra. In this event, in addition to the traditional presentation, there was the live projection of images of the Moon and the planet Mars. In total, considering the five events organized, 205 cars participated, with an estimated total audience of at least 820 people. |
| Oral presentation | Marieke Baan (NOVA, Netherlands) David Redeker (NOVA, Netherlands) | How to communicate boring stuff | Communicating about scientific results and especially about astronomical instrumentation is a challenge. It just never seems to be the right moment for communication. Contract? Preliminary Design? First prototype? Shipping? First light? First results? Each of these phases is a milestone for astronomers and technicians, but not necessarily for the general public. Journalists consider it boring. How can Public Information Officers tackle this problem? The answer is simple: be proactive and wrap your message in a wider narrative or story. But how? Marieke Baan, Head of Communications of the Netherlands Research School for Astronomy (NOVA), will show some lessons learned about communication on ‘difficult’ and ‘boring’ topics. One of her tricks: organize small events and excursions for selected journalists. |
| Oral presentation | Chiisato Ikuta | Hayabusa2’s outreach activities | In this presentation, we describe the strategy and implementation of Hayabusa2’s outreach activities. We also share our Lessons Learnt. Hayabusa2 is an asteroid sample-return mission operated by JAXA (Japan Aerospace Exploration Agency). Launched on 5th December 2014, it returned to Earth to deliver the material collected from the target object, asteroid Ryugu. Even before its launch, Hayabusa2 had been already famous in Japan. Thus, the increase in the mission’s awareness could not be the public outreach goal. The outreach team aimed to raise understanding of the space exploration mission and space science with its risks, challenges, values, and difficulties. It was evident that it would need a comprehensive strategic approach to communication to meet the demands of the Hayabusa2 fans. Besides, Hayabusa2’s critical operations were an excellent chance to reach out to people who do not usually relate to scientific or technological issues or read the science sections in newspapers and websites. Our goal of the public outreach is to raise understanding and support by providing transparent information. First, we distributed video clips and images under Creative Commons Attribution 4.0 to the media and citizens to maximise the reach within minimum efforts. Second, press conferences were frequently held and contributed to establishing a good relationship between the press and Hayabusa2’s team members. Hayabusa2 representatives described the process of space exploration and explained the risks of operations. These explanations helped to control public expectations. Although there are some points we need to reconsider, it seems we accomplished the goal overall. The steady and long-term communication efforts by the outreach team have earned strong support from the public. The engagement with the public is a critical element of the success of the Hayabusa2 outreach. |
Oral presentation

Sanne van Gammelen
Pedro Russo, and Mohammad Javad Torabi
Eugenio (Press Rodriguez Nayra Mohammad Sanne van Inte Group Leiden University)

Community strategies for Public Observatories: the case of Leiden Observatory

The Old Observatory Leiden (The Netherlands) is the oldest still operating University Observatory in the world, originating from 1633. During its operating years, the observatory has served as a training center for astronomers and has played an important role in the dissemination of astronomy research. In 1974, the research department moved to new research facilities outside the city, leaving the Old Observatory in the city center of Leiden. Today, the Old Observatory serves a wider audience. Its mission is to involve the general public in the wonders of the Universe. While its rich history is respected and communicated through tours of the historic building, the Old Observatory has also been involved in innovative endeavors in the areas of Art-Science projects and STEAM education in the last years. Engaging students with astronomy can be done during school hours, but children spend only 16% of their waking time in the classroom and therefore 84% of that time not in school. In addition, the time for astronomy within formal education is limited. Combining opportunities for talent development regarding astronomy both inside and outside of school hours is therefore very important. And we must stimulate these talents structurally in various learning environments. That’s why the Old Observatory has set up a strategy to engage children with astronomy in various ecosystems. The Old Observatory carries out different activities and programmes, with the help of the volunteer network. Under the umbrella of the old observatory, several volunteer groups have emerged over time, who together exert strong influence on the identity of the Old Observatory and all play a role in the continued existence of the Old Observatory. There is a group who maintains the historic telescopes (WLS), a group that provides educational programs (Kaiser), a group that introduces children to astronomy in an even more informal setting and within astronomy clubs (JWIG) and a group that serves an older audience through lectures (LWSK). The efforts of all these groups combined make sure the Old Observatory provides relevant educational offers for different members of the local community. In this presentation, we want to give the listener tools to work with new communication strategies for their own public observatory. We will present the various efforts of the Old Observatory within different learning ecosystems and different target audiences, such as interactive lessons during primary school, online broadcasts of observing nights for families, setting up a telescope lending system at local libraries and a science club in socio-economic disadvantaged neighbourhoods and establishing an astronomy makerspace for STEAM learning. We also show what role our volunteering groups play in these different endeavors. Many of these initiatives arose during the pandemic. It has forced us to be efficient with our energy, made us pay extra attention to our people and use our creativity in new ways.

Oral presentation

Mohammad Javad Torabi
Pedro Russo, and Mohammad Javad Torabi
Nayra Rodriguez Eugenio (Press Outreach Unit, IAC)

“Talk to Them: Women in Astronomy” team

The future reference for content production; Reputable media or social media influencers?

During the outbreak of COVID-19, the way of dealing with and communicating with astronomical audiences in Iran completely changed. Like many other countries in the world, webinars replaced face-to-face seminars, and instead of the usual science television programs, there are live shows on social media and online platforms that are widely viewed. The webinars are so well received that it is clear that after the pandemic, classes and seminars will no longer be the same as they were in the past. Besides, astronomical tourism is active only in its weakest and most limited state. The COVID-19 outbreak resulted in declining print sales because people avoided outdoor goods. In contrast, magazine subscriptions and online book purchases have become more popular than in previous years. All of this showed how dynamic astronomical institutions must be to survive after such a global event. In other words, it was no longer possible for multilateral astronomical institutions to continue to operate as in the past. Failure to hold annual events such as World Astronomy Day, World Space Week, and Yuri’s Night, as well as cancellation of monthly events such as monthly events of astronomy clubs, held on a special day at the beginning or end of each month, and in the absence of annual events such as the Messier Marathon, caused the level of communication between astronomy enthusiasts in Iran to be minimized. However, the need for video communication was greater than ever, and as a result, the monopoly of producing studio content from several individuals or entities was broken, and hundreds of people produced video content, usually in the form of live Instagram or webinars. This multiplicity of content production reduced the comprehensiveness of traditional media and reduced the scientific sensitivity of the content produced. So that each person has the opportunity to convey the content to their audience, without having experience and expertise in education or media work. As much as this brings society closer to a free and polyphonic world, it has raised concerns about inaccurate content. In the era of changing the work style of traditional and prestigious astronomical institutions, have social media influencers, instead of the reputable media outlet, become the main source of information? Does this change affect the quality of the content provided? These are the questions we’re looking for answers to by talking to different experts.

Oral presentation

Sanne van Gammelen
Pedro Russo, and Mohammad Javad Torabi
Eugenio (Press Outreach Unit, IAC)

“Talk to Them: Women in Astronomy” team

The Old Observatory Leiden (The Netherlands) is the oldest still operating University Observatory in the world, originating from 1633. During its operating years, the observatory has served as a training center for astronomers and has played an important role in the dissemination of astronomy research. In 1974, the research department moved to new research facilities outside the city, leaving the Old Observatory in the city center of Leiden. Today, the Old Observatory serves a wider audience. Its mission is to involve the general public in the wonders of the Universe. While its rich history is respected and communicated through tours of the historic building, the Old Observatory has also been involved in innovative endeavors in the areas of Art-Science projects and STEAM education in the last years. Engaging students with astronomy can be done during school hours, but children spend only 16% of their waking time in the classroom and therefore 84% of that time not in school. In addition, the time for astronomy within formal education is limited. Combining opportunities for talent development regarding astronomy both inside and outside of school hours is therefore very important. And we must stimulate these talents structurally in various learning environments. That’s why the Old Observatory has set up a strategy to engage children with astronomy in various ecosystems. The Old Observatory carries out different activities and programmes, with the help of the volunteer network. Under the umbrella of the old observatory, several volunteer groups have emerged over time, who together exert strong influence on the identity of the Old Observatory and all play a role in the continued existence of the Old Observatory. There is a group who maintains the historic telescopes (WLS), a group that provides educational programs (Kaiser), a group that introduces children to astronomy in an even more informal setting and within astronomy clubs (JWIG) and a group that serves an older audience through lectures (LWSK). The efforts of all these groups combined make sure the Old Observatory provides relevant educational offers for different members of the local community. In this presentation, we want to give the listener tools to work with new communication strategies for their own public observatory. We will present the various efforts of the Old Observatory within different learning ecosystems and different target audiences, such as interactive lessons during primary school, online broadcasts of observing nights for families, setting up a telescope lending system at local libraries and a science club in socio-economic disadvantaged neighbourhoods and establishing an astronomy makerspace for STEAM learning. We also show what role our volunteering groups play in these different endeavors. Many of these initiatives arose during the pandemic. It has forced us to be efficient with our energy, made us pay extra attention to our people and use our creativity in new ways.
Communicating Astronomy to the public has always been inspiring and demanding at the same time. Creation of suitable concepts for both, adults and children, and its exciting intermediation are a key concept in this field. Restrictions accompanying the current global pandemic complicate profound science communication as events like talks, workshops, guided tours are not feasible anymore or only under very strict measures. New possibilities and outreach concepts are in great demand if we want to stay connected with the public. Especially the current situation illustrates even more the necessity and value of proper science outreach work. At the Planetarium and Urania & Kuffner Observatories of Vienna, this issue has affected us since the start of the pandemic. With no in person shows and tours possible, we decided to develop an alternative way to share astronomy with the public. We started to adapt our presentations to online webinars using conventional applications such as the free open source planetarium software "Stellarium". The webinars are designed by the managing and executive team of the Planetarium Wien; the presentations are done by us, the science educators. Our latest product is the adaption of our format "Space4Kids" which is a show suited for children aging 6-10 years. It aims to introduce children to the objects we observe in the sky (stars, planets, shooting stars etc.) and create a basic understanding about them within one hour. In this new concept we integrated more interactive elements, like polls and a go-along experiment. This format reached a big echo with an audience of up to 200 listeners per webinar and encouraged us to optimize this concept further on and eventually adapt other shows according to this scheme. As we are sure various institutions conducting outreach, no matter if universities or public ones, could benefit from this approach, we would like to present our webinar concept during the CAP 2021 conference. We will present the basic set up we developed and take you on a tour from the beginning of the production to the final presentation. We will also give insight into the regular version of the show we usually present at the planetarium to emphasize the differences to consider when adapting such a format to a webinar with respect to content, length and interactive components. Our presentation will not only focus on the overall style for an appealing webinar but also includes our approaches of dealing with the challenges to find the appropriate intensity of information and knowledge to be transferred to the target group. With the presentation of our "Space4Kids" webinar, we want to introduce a format to keep in touch with the audience and to uphold their interest in astronomy. That way we hope to inspire our colleagues to use similar formats for their outreach work to face challenging times like the current pandemic.

The high scientific production in astronomy impel us to find new ways to carry out scientific dissemination of content, but also, of processes. Thus, we can promote positive attitudes towards science and the public can more easily deal with bad science, scientific fraud and fake news. In this context CoAstro: @n Astronomy Condo emerged – a citizen science project that directly connected four astronomers, nine elementary school teachers, four science disseminators and one mediator. CoAstro’s, whose first edition lasted an academic year, scientific content and processes were appropriated and integrated by teachers in school initiatives, reaching approximately one thousand pupils. "Stars" and "Planets". In the first, teachers analyzed standard stellar spectra that allow the qualitative and quantitative composition determination of 57000 stars. In addition, they determined star luminosity using Data Release 2 from the European Space Agency – ESA – GAIA Mission. In the planets project the team started with the production of a planetary transit video, through the Python program. Then, teachers analyzed curves to signal the presence of potential exoplanets. In the process, the mediator was integrated: he adapted the language and created "guidelines for research tasks". He also ensured the maintenance of the collaborative work, articulating the challenges of research, dissemination and teaching. The scientific analysis of CoAstro’s results was achieved by implementing a qualitative research. The data were collected through questionnaires, interviews and observations. Results showed high improvements in teachers’ substantive and processual knowledge; positive change in epistemological attitudes and beliefs towards astronomy; as well as, the increasing of the quality of teachers’ scientific dissemination practices. Data from astronomers and disseminators, showed one main difference: science disseminators (unlike astronomers), have not changed their perception about teachers’ professional class, due to their participation in CoAstro. Indeed, both groups agree that the project: i) was useful (and facilitated) astronomy dissemination work; ii) it was an opportunity for teachers to increase their procedural knowledge about astronomy; iii) was, at the outset, risky, because of its idea of involving teachers in real astronomy research; iv) reinforced their own perception about the importance and purposes of dissemination practices, promoting new communication skills and new ways of structuring astronomy dissemination activities. Although with some implementation difficulties (time, adequacy of tasks ...). CoAstro allowed us to understand how a citizen science project can contribute, with lasting and wide-public-ranging effects, to open the school to the surrounding community and vice-versa and how the public can open up to astronomy research and the latter to the public.

Astronomy unlike other modern scientific disciplines carries a substantial cultural and historical baggage from an era when the universe was perceived to be geo-and anthropocentric. India because of its antiquity and continuity follows notions, beliefs, and practices which seemed natural in an earlier era but are now known to be inconsistent with modern astronomy. It was believed that as education spread unscientific and extra-scientific beliefs would weaken and disappear. This indeed was the case for a few decades after 1950, But the trend has reversed with the onset of globalization era. Not only has the pseudo-science of astrology come back there inconsistent with modern astronomy. It was believed that as education spread unscientific and extra-scientific beliefs would weaken and disappear. This indeed was the case for a few decades after 1950, But the trend has reversed with the onset of globalization era. Not only has the pseudo-science of astrology come back there different than the person sitting at the next office desk. Astrologers, soothsayers and fortune-tellers are willing to prepare a mix of the so-called calamitous phenomena, zodiacal signage, geomancy, and dress code to make their client important in the cosmic scheme of things. As dependence on technology has increased respect for science has gone down. At the same time high technology as represented by television, internet, and social media seems to have bestowed legitimacy on their content irrespective of its intrinsic merit or demerit. It would be instructive to discuss details of this new phenomenon and compare it with situation in other culture zones.
Oral presentation

Victoria Kolesnichenko

Introduction

In the eyes of the media, and even the academic community, Venus seems to be treated as a 'Cinderella' among the planets of the solar system. For many years, it was almost forgotten by public, hidden in the shadow of Martian media fame, too inhospitable for life, without any hope for visits from earthlings. Then, in 2020, she suddenly shone in the light of news about the possible detection of a possible biomarker. The magic brought by phosphine-related speculations did not last long, but with the help of the earlier theories and active mediatization of this research area, the position of Venus seems to have changed for the better.

Methodology in the course of the study of the coverage of Venus by the Russian quality media, we performed content analysis of the web versions of newspapers Rossiyskaya Gazeta and Izvestia. The sample included 102 texts found by the keyword “Venus”. The study excluded materials in which Venus was mentioned only in passing, as well as items that were not related to science. The examined materials were published from 01.01.2011 to 01.01.2021. In this study, we have looked into the topics covered in relation to Venus and the sourcing preferences of the journalists of the media under review. Results

The most extensively covered topics through the years include the possibility of life on Venus (35 published items), a new mission to Venus ("Venera-D") (30 items), and various atmospheric phenomena (28 items), e.g. transit of Venus across the Sun. Russian press covered the astrobiological aspects of the studies of Venus in 2015, 2016, 2019 and 2020. Overall, the coverage of Venus included an early age and I will discuss the different approaches in exposing astronomy in classrooms. Finally, I will present the challenges one faces when driving such activities held virtually in the middle of a pandemic, when physical presence in schools is not possible and when distractions are readily available.

Oral presentation

Evanthia Hatziminaoglou

Bringing astronomy to the classrooms in the middle of a pandemic

In the proposed talk I will discuss my experience in communicating astronomy to schools (ages 10-18). I will first highlight the benefits of bringing astronomy to the classrooms, also as manifested by the great feedback demonstrating the pupils’ motivation and engagement. I will touch upon the latest on gender stereotypes among children from the literature, as well as the wide-spread social norms and misconceptions expressed during the discussion with the pupils, that ultimately prevent girls from reaching their full potential and following science-related careers. I will then focus on the need to strengthen the links between astronomy and the general public already at an early age and I will discuss the different approaches in exposing astronomy in classrooms. Finally, I will present the challenges one faces when driving such activities held virtually in the middle of a pandemic, when physical presence in schools is not possible and when distractions are readily available.

Oral presentation

Martin Archer

Hearing the invisible: The versatility of sound in engaging

Space physics is a largely invisible field based primarily on in situ satellite observations. Therefore, unlike many other areas of astronomy, it cannot rely on visually arresting images to engage audiences with the research. However, time series naturally lend themselves to another of our senses – sound. We discuss how time series can be converted into sound, known as sonification, demonstrating the versatility of this sonified data in engaging publics through a variety of different approaches: 1. Communicating research: High-profile results have been brought to life using sound, garnering international media attention in the process thanks to sonification making the science more accessible. 2. Immersive experiences: Young families after having experienced a soundscape exhibit show a greater diversity of words and pictures about what space is like, moving away from the misconception of it being completely empty and silent. 3. Creation of art: Sonified data can be used as key creative elements in the production of films, providing fresh perspectives on the data, bringing the science to totally new audiences, and prompting dialogues between ordinarily disparate groups. 4. Exploratory citizen science: Sonification allows exploration of data simply by listening to it, which can enable people, e.g. school students, to identify events that standard visual/computational techniques struggle with and therefore contribute to current research.

Oral presentation

Suresh Bhattarai, Manisha Dwa

Astronomy Outreach in Nepal

This paper will share some of our struggles that we faced communicating astronomy with public in Nepal. It will present an overview of the development of the people’s understanding of astronomy and astrology and how we have been dealing with them since 2007. We will share the evolution of our communicating strategy over the course with the rise of Social Media and access to internet in Nepal. We will also be sharing some of our outreach initiatives which helped us to have better astronomy communication in Nepal.

Oral presentation

Richard Tresch

Words Matter: Communicating Science in an Age of "Alternative Facts"

British playwright George Bernard Shaw famously quipped, “England and America are two countries divided by a common language.” This could also be said of scientists and nonscientists. We use the same words, but not always with the same meanings. Consider the word “theory.” To scientists it means a logical, coherent set of facts and principles that naturally explains multiple observed phenomena and makes predictions that can be tested and thereby confirmed or refuted. To the public, it often means nothing more than an idea, hunch, or guess. Press releases and news articles about scientific discoveries often include such ambiguous words, as in the headline “NASA Finds Direct Proof of Dark Matter.” If we have “proof” of dark matter, why are astronomers still debating its existence, as reflected in the subsequent headline “Factoring in Gravitomagnetism Could Do Away with Dark Matter?” Ignoring the question of whether the word “gravitomagnetism” belongs in a headline, this illustrates how using words that mean one thing to scientists and another to the public can confuse audiences and unintentionally contribute to people’s growing mistrust of scientists and other experts. In this presentation I’ll show some additional examples that highlight words to beware of when communicating science. I’ll suggest some strategies that communicators can use to avoid inadvertently confusing or misleading their audiences with such words. And I’ll mention some other ways to address this and related problems in science communication, including some that will require collaborating with other science-minded communities such as formal and informal educators.
Oral presentation

Sara Anjos, Pedro Russo; Anabela Carvalho

Communicating Astronomy with the Public: Perspectives of an international community of practice

In order to foster connections and mutual understanding between research communities and other sectors of society, science communicators aim to develop a “common language” in their practice (Meyer, 2010; Stockmayer et al., 2001). Practitioners of science communication may simultaneously be members of multiple professional groups and take up different roles, such as scientists, informal science educators, press officers, science journalists, bloggers, and others. It is often the case that science communicators organize themselves into networks of knowledge and experience sharing, i.e. into communities of practice. These are composed of (groups of) individuals that gather around a common goal: the wish to improve communication practices brings the community together. Practitioners act within their community of practice according to their institutional role and develop various forms of interactively aligning perspectives and facilitating transactions among multiple stakeholders (Kuhn, 2002; Meyer, 2010; Wenger, 2009). Several studies have focused on scientists’ participation in science communication (e.g. Bauer & Jensen, 2011; Besley & Nisbet, 2013; Entradas & Bauer, 2019; Wellcome Trust, 2001); however, research that focuses primarily on practitioners’ perceptions, and especially on the roles of this community of practice, is scarce. Therefore, the contribution of these specific social groups and structures to the science-society relationship has been overlooked. Aside from this research gap, there seems to be a certain distance between the practice of science communication and the corresponding academic research (Miller, 2009; Niesch et al., 2016). In this paper, we argue that constraining science communication practitioners and academics are distinct communities, narrowing the relationship between research and practice in science communication is a continuously important goal (Seethaler et al., 2019). In fact, there is evidence that when this kind of collaboration between research and practice on science communication occurs, multiple benefits are achieved (Riedlinger et al., 2019). Therefore, furthering dialogues between science communication research and practice (E. A. Jensen & Gerber, 2020), bringing practitioners’ experiences to peer-reviewed literature, and linking empirical scholarship to practice are expected to promote mutual gains, and unleash diverse opportunities for improvement concerning a variety of topics and methods for communicating science. We aim to present findings of a study that looks at the perceptions, practices and concerns of the astronomy communication community, specifically regarding how astronomy communication practitioners conceive their publics, what kind of public engagement do they seek and how do they appropriate science communication research in their practices.

Oral presentation

Gustavo Rojas, Sara Anjos, Maria Luisa Almeida, Priscila Doran, Rosa Doran, Sharaon Govemment

Science communicators and educators working together during lockdown

Involving teachers in astronomy communication projects has been shown as an effective strategy to empower young people in science. It is recognised that teachers and science at school play a major role in encouraging young people to enjoy and engage with science. Teachers thus become key agents in engaging their students, which can be reflected not only in the interest that youngsters develop in science subjects and careers but also in the way they relate to science throughout their lives, even if they do not choose scientific careers. In this sense, empowering teachers to be, besides educators, effective communicators of the science of astronomy is one of the fundamental goals for a healthy relationship between science and the young public. We found that teachers need to feel supported to communicate this subject. The fact that many of them had no contact with astronomy while they were being trained to be teachers makes them insecure. Supporting the educational community to communicate astronomy is therefore a goal we have set ourselves. The COVID-19 pandemic disrupted almost every aspect of our daily lives. In science education and science communication, the organization of academic events had to be adapted to a fully online format. In particular, this configuration is not very common for teacher training workshops which rely on direct interaction between the attendance and facilitators. In this presentation, we report the strategies and results employed in three specific communication projects and their contributions to the above-mentioned challenges. The projects are: Global Hands-On Universe Conference, an online conference held in August 2020 and attended by more than 500 registered participants. It featured an ambitious program, consisting of an opening 24-hour webcast with invited speakers, followed by 5 days of talks and teacher workshops. All sessions were broadcasted live on Facebook, reaching a wide global audience. Our Space Our Future, a European Project that brings space science to the classroom and the community, boosting the interest of students in space-related careers and showing the community how space impacts our lives. It brings together students, teachers, and the local community in events. During the lockdown, social media was one of the most important tools used to cast challenges that families could do together, although they could also be used by teachers in the classroom. FRONTIERS, an Erasmus+ project that integrates modern Physics in the school curriculum offering tools and access to rich scientific databases and resources in a variety of fields that can provide a catalyst for science learning. During the pandemic, virtual visits were streamed on Facebook: to the VIRGO interferometer, to CERN, and the Pierre Auger Malargüe Observatory. This was a great opportunity to reach a diverse audience: teachers, students, families, and the general public.

Oral presentation

Chris Impey

Astronomy Education and Outreach Online after the Pandemic

One side-effect of the COVID-19 pandemic has been increased enrollment in online classes. Massive open online classes (MOOCs), in particular, can allow free-choice informal learners worldwide to engage with astronomy. MOOCs bridge the worlds of education and outreach; they are structured to be coherent learning experiences, but participants do not take them for grades or college credit. MOOCs use a core of video lectures, but they can be augmented with interactive simulations and citizen science projects, plus engagement through social media and discussion boards. This presentation presents the lessons learned from over seven years of experience with astronomy MOOCs that have enrolled 280,000 people in 180 countries worldwide, with over 20 million minutes of video content watched. Last year, two of these MOOCs, offered through Coursera and Udemy, saw an increase in enrollment by a factor of ten over the similar time span in previous years. Learners enrolling during the pandemic were more likely to be younger than thirty and less likely to have degrees. The majority were full-time undergraduate students and relatively few were professionals in technical fields. The largest number of new students were from India and overall, the biggest surge in enrollment came from people living in developing countries, particularly in Asia. Those who enrolled during the pandemic were more likely to take the course to get a certificate or to further their career goals than because they had intrinsic interest in the subject. Social motivations were very important, particularly among full-time students taking the course. These results suggest that new audiences have been turning to online classes during the pandemic to gain credentials or advance their professional skills. However, the core audience for astronomy MOOCs continues to be adults drawn to the subject’s intrinsic beauty. The popularity of MOOCs is likely to keep growing after the pandemic has abated. More generally, astronomy education and public outreach will need to deploy increasingly diverse and creative digital media to compete for attention in a crowded arena of online content.
Oral presentation
Simone Iovenitti  
Luca Perri  
HOW TO (DIS-)ASSEMBLE A PLANETARY SYSTEM  
Nowadays, scientific computer simulations have reached amazing graphic results, providing awesome visual descriptions explaining the evolution of very complex physics phenomena, implementing the laws of Nature. Sometimes, without a scientific guide, it is difficult to distinguish between simulation and reality, but the usage of advanced and spectacular animations is a powerful way to convey both accurate scientific information and passion for science. According to this, we decided to develop a novel laboratory based on an unconventional instrument: a videogame. Universe Sandbox is a physics-based space simulator, a commercial software that can be downloaded from the most common videogame platforms (e.g. steams.com). It merges gravity, climate, and physics laws in a virtual environment that can be created from scratch, simulating the birth of a certain astrophysical system and considering its evolution with time, or the effects of the manipulation of its parameters. With this software, we prepared a set of dynamic scenes to take the public through a virtual space journey whose main topics were planetary formation, orbits, habitable zones, types of stars, stellar explosions, and asteroids collisions. However, an important feature of Universe Sandbox is that any simulation is quite easy to be built, but it requires a good knowledge of physics to obtain a realistic result. For this reason, we chose to involve the audience in the process of creating the simulations, setting the interaction with the public at the heart of this experience: every question, argument, or idea from the audience, was answered by the relator performing a simulation in Universe Sandbox created in real-time. Even the fanciest and odd suggestions were accepted, exploring the effects of physics laws even in unlikely contests: we saw collisions between planets, comets interactions, planetary systems around black holes, frozen or burning worlds, and many other strange situations. At each time, results were commented on under a scientific perspective, and the connection with well-known cases was discussed in detail. Our laboratory was first proposed to the national festival of science in the city of Bergamo, in Italy. The city was heavily affected by the COVID-19 pandemic, so our activity was delivered online, using a remote connection and screen sharing. Both school groups (primary to high school) and the general public participated in this activity, and we had excellent feedback from all of them: the workshop helped to reveal both the beauty of our universe and the fragility of our planet, that we must take care of. Several schools chose to buy the software themselves and asked us to replicate the workshop for their future students. This workshop is suitable to be delivered everywhere, in every contest. It could be also an in-presence activity, with the usage of a projector for showing the virtual environment or exploiting a network of VR headset.

Oral presentation
Rosa M. Ros Vilués, Ricardo Moreno, Beatriz Garcia  
Education Network in Astronomy Schools - NASE, spreading astronomy through the world  
NASE (Network for Astronomy School Education) is a successful program devoted to training teachers and professors in didactic of the Astronomy in an innovative way, bases on the hands-on-activities with simple, not expensive resources and tools, without resign the excellence in the level of transmission of the contents. The program, developed between 2009 and 2020 more than 200 courses in America, Asia, Africa and Europe and created more that 40 Local Groups, which maintain each year the activity in their own countries but also participating in activities in other countries and continents as international invited trainers and contribute with the preparation of innovative activities and workshops devoted to Cultural Astronomy. The main characteristic of this proposal is to provide of tools to use the astronomy as an interdiscplinary activity, which can be used to teach different sciences not only the natural ones, but also Social Sciences. In 2020, the new modality online was offered with a very good reception and many lessons were learned. In this presentation we will show not only the general structure and the fundamental milestones of the program in their 10th anniversary, but also how the program grew along the years and was able to adapt their format and contents to new modalities of the teaching-learning processes. The role of the NASE Local Groups is also rescue and the approach to the a global movement of high level trained teachers in the figure of the NASE Ambassadors is also detailed.

Oral presentation
Brian D. Ottum, Ph.D.  
LIVE and INTERACTIVE PUBLIC STAR PARTIES  
I've been a fanatic amateur astronomer since age 12, and explored many facets of the hobby. Bitten by aperture fever, I worked my way up to a 20" dob in a backyard dome. I’ve chased several total solar eclipses. When digital cameras became available, my astrophotography interests were ignited. I went “all in” and relocated my telescope & camera to a remote-control observatory located in the desert southwest. My images have been printed on metal, and I’ve sold hundreds. However, it is the public outreach facet of astronomy that I keep returning to. As a teen, I kept a log of everyone who looked through my scopes. I hauled my scopes up to the top of a mountain to do a star party for the International Planetarium Society. I’ve spent an entire summer as an astronomy volunteer at Bryce Canyon National Park. I led the dedication ceremony for one of Michigan’s “Dark Sky Preserves.” For the past 5 years, I’ve been responsible for bringing volunteers with telescopes to a summer camp for the disadvantaged youth of Detroit Public Schools. I’m frequently interviewed on local radio and online news sites when there is an impending astronomical event. This winter I’m doing live demonstrations for a Michigan STEM event. Over the past year, I’ve started to do live and interactive public events on my YouTube channel. My goal is to educate and entertain, by trying to recreate the in-person star party experience. My system allows the taking of high quality, 30 second, full color images, during which I explain the object we are about to see. We quickly move from object to object, seeing over a dozen in the hour. Viewers can ask me questions in the chat window. More recently, I’ve begun to encourage audience requests so we can show the objects of most interest. Recent sessions: “Christmas Star Conjunction: Jupiter and Saturn,” “Galaxies,” “Treasures in Orion” and “Stars Being Born in the Winter Milky Way.” In total, I’ve had over 5,000 viewers. I can pass along some do’s and don’ts. DO: take advantage of an astronomical event that is getting a lot of attention in social media in order to educate, keep explanations simple, focus on cool topics, move along quickly, use technology that is built for speed, use multimedia, tell stories. DON’T: spend a lot of time talking about the technology, show B&W images, make the audience wait for the image to “develop,” show a screen with extraneous details, have glitches or delays, be boring. KISMIF: keep it simple, make it fun. I’m prepared to show how to do this; and help others do it. Am happy to do a poster, oral presentation, workshop or be on panel discussion.
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<th>Oral presentation</th>
<th>Douglas N. Arion</th>
<th>None</th>
<th>Astronomy as the Messaging Core of Public Science and Environmental Education</th>
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<td>Since 2012 the Mountains of Stars (MoS) program has informed the public on science and the environment using astronomy as the core. A partnership of scientists, academic institutions, and leading environmental and outdoors organizations, MoS has reached over 65000 people and trained more than 300 students and nature and outdoor guides and educators. Rather than communicating astronomy per se, astronomy content and activities (including day and night observing, planetarium shows, hands-on demonstrations, and other modalities) are utilized to redirect public understanding and behaviors towards the natural world and the environment. Astronomy, as the overarching science, is the perfect subject for general public science education, but a strong messaging component and science communication training are critical to that success. This presentation summarizes the approaches we utilize and the positive results we have achieved, as measured through an assessment and evaluation process that has tracked outcomes for both public participants and the individuals we have trained as docents and public engagement agents. It is our hope that this model will be replicated to advance public science understanding and behaviors that benefit the environment and natural world by giving people a better understanding of their origins and place in the Universe. This work has been supported in part by the US National Science Foundation, the Gordon and Betty Moore Foundation, the VVR Foundation, and the Toomey Foundation.</td>
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<th>Oral presentation</th>
<th>Rachele Toniolo</th>
<th>Using pixel art in didactics astrophysics</th>
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<td>Computational thinking is one of the skills needed to face the challenges of the twenty-first century. In fact, it helps to evolve logical skills and the ability to solve problems creatively and efficiently, qualities that are important for future citizens. Computational thinking develops through programming, that is, by writing a series of sequential instructions that lead to the solution of the problem. Over the years, various programs have been created to help children develop this competence, such as Scratch, a programming environment that uses graphical and intuitive language. A second way to obtain this important skill is &quot;coding unplugged&quot;, which is the set of activities that use non-digital tools to introduce the fundamental concepts of computer science and programming logic. It is part of &quot;pixel art&quot;, a term that indicates any drawing that highlights the checkered structure of the images. Children are given a code defined as a sequence of colors and numbers that represents the procedure with which to color the squares of a grid to obtain the image. In astrophysics this discipline helps to explain the concept of resolution of digital images: each of them is made up of a number of small squares called pixels. The higher their number, the better the image resolution and vice versa. Following these considerations, I have developed several astrophysical themed pixel art cards. The resources are available on the play.inaf.it website, a platform containing various educational resources created by researchers from the National Institute of Astrophysics (INAF). The cards (available in both color and black and white) contain the grid to be colored, the code to use (obtained using the zaplycode.it site) and a brief introduction to pixel art. These resources have been greatly appreciated by Italian schools which, especially in these months when distance learning is required frequently, do not always have the digital tools for coding available.</td>
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<th>Oral presentation</th>
<th>David Keitel</th>
<th>for the LIGO Scientific Collaboration, Virgo Collaboration, and KAGRA Collaboration</th>
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<td>&quot;Science Summaries&quot;: explaining LIGO-Virgo-KAGRA results to the global public</td>
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<td>LIGO, Virgo and KAGRA form the second-generation global network of gravitational wave detectors. From the first detection of the GW150914 binary black hole merger to the latest results from the recent O3 observing run, our observations are pushing frontiers in observational astrophysics. To continue inspiring the wider public with our findings, one key communications activity of the LVK collaborations are &quot;science summaries&quot; for each of our papers. These texts provide a less technical introduction to the topics covered in each paper and its key results, aimed at both students and interested lay readers. They are published at <a href="http://www.ligo.org">www.ligo.org</a> and promoted through social media channels of the three collaborations. Before the pandemic, they also proved popular as printouts at science fairs, and we all hope we can return to that mode of outreach soon. As a global collaboration, over recent years we have also significantly stepped up our output of translations of these summaries, drawing on member scientists from across the globe, with materials published in a total of 23 different languages so far.</td>
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<th>Oral presentation</th>
<th>Anna Wolter</th>
<th>Adamantia Piaia, Caterina Bocciato, Elena Zucca, Giuseppe Cutispoto, Livia Giacomini, Marco Castellani, Mauro Gargano, Sandro Bardelli</th>
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<td>Art and literature to engage in astronomy: experiences from the pandemic</td>
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|                   |                  | During the COVID-19 pandemic we, at the Italian National Institute for Astrophysics (INAF), were forced to work from home, as most people. We soon realized that the day was full (fuller than before!) of talks and interactions over the Internet, and figured that this was the case also for students of all ages. Besides, most of the interaction kids have through the net is one way only: they look and listen but they do not act. We devised to open to the whole Italian community a drawing competition that had been running in Italy for more than a decade. "Osserva il Cielo e Disegna le tue Emozioni" (Observe the Sky and Draw your Emotions) became the first competition to be hosted by the newly opened online magazine EduINAF. We received more than 300 drawings and 3D creations. One of these drawings was chosen as the poster of this conference. Given the success of the initiative, we decided to run a new competition ("A Gianni Rodari, via Lattea quaracquini"). This time of creative writing, in honor of one of the most interesting authors of children’s books, Gianni Rodari, a hundred years after his birth. Rodari had theorized the use of imagination both in writing and in making science. This initiative was also a success, with more than 400 short stories and poetical compositions sent in response. Both contests were addressed to kids of age 6-14 and we received warmth and encouraging feedback from participants, as well as from their families and teachers. In this talk we will show how we organized the competitions, what were the strong and weak points and why we have decided to continue with new editions in the coming years. We aimed at being inclusive, in the context of STEAM. There is no wrong answer in art, and therefore everyone feels entitled to participate. The "A" helps in teaching the power of observation, of the situation and the surroundings: we had many artworks that expressed both the fear of the pandemic and the hope for a better future, like a comet grabbing all of the bad virus and feelings in passing nearby the Earth. As a competition "prize" we asked two special readers to record their interpretations of the winning texts, for our YouTube channel: the Italian astronaut Samantha Cristoforetti, and a young author of the national TV school channel, Davide Coero Borga. The videos are there for everyone to enjoy. And, following Rodari, we can remind everyone that "The sky belongs to everyone" ...the sky belongs to all eyes of each eye is the whole sky. It is mine when I look at it. It belongs to the old man, to the child, to the king, to the gardener, to the poet, to the cleaner. ...
<p>| Oral presentation | Manuel González García | Natalie Ruiz Zelmanovitch; Conchi Lillo; Mario Peláez Fernández; Paula del Río Manzanas; Mikel Herráiz Subiñas; Maite Alonso; Nieves García Corpas; | Astrochotis, a tribute to Jocelyn Bell | The Pandemic situation pushed many outreach activities to the internet. Talks, events, celebrations, were redesigned to go online. Our presentation wants to introduce the colleagues to a new crazy way to mix cabaret, astronomy, outreach and humor (previously initiated on theatres) with traditional music, in this case, a style known as choits and typical from Madrid (Spain). The presentation fits the topic &quot;Nontraditional Ways of Communicating Astronomy During a Pandemic&quot;, and we center it on the Astrochotis, one of the activities of an outreach group created around &quot;CienciaVisión&quot;, a contest organized in March 2020 whose aim was to use Eurovision songs, changing the original lyrics and creating a science karaoke where the singers were scientists, researchers, journalists, public information officers, etc. The Astrochotis tells, in a 15-minutes video, the story of Jocelyn Bell, the first-class British astronomer who contributed decisively to the discovery of pulsars but who did not get the Nobel prize for it (whereas her PhD supervisor was awarded for this discovery). With a musical format, several Spanish science communicators explain Prof. Bell's life, using songs to tell several chapters of her story, from her childhood to the Breakthrough Prize (going through the no-Nobel). It was published online the 15th of May (the day of Saint Isidro, patron saint of Madrid, when Madrileños use to sing and dance choits) using traditional songs from Zarzuela and other styles and, the most important, it was a tribute to Jocelyn Bell and her story. |
| Oral presentation | Sandra Benítez Herrera | Jorge Rivero González, Andrea Rodriguez Antón, Nayra Rodríguez Eugenio, Fabio del Sordo, Diego Torres, Eduardo Penteado, Mayte Vázquez, Felipe Carrelli, Demetrio Rodrigues, Hamdi Mansour, Alberto NEgrín, Alba Fernández Barral, Sarah Massalkhi. On behalf of GalileoMobile. | Astronomy for Development actions in the context of long-standing refugee situations: the &quot;Amanar: under the same sky&quot; initiative. | Amanar: under the same sky&quot; is a science outreach project organized by GalileoMobile, the Asociación Canaria de Amistad con el Pueblo Saharaui (ACAPSA) and the Instituto de Astrofísica de Canarias (IAC), with the aim to support and inspire the Sahrawi community from the refugee camps in Tindouf, Algeria, using Astronomy. The initiative pays special attention to Sahrawi children and youth to awaken their interest in science and stimulate their imagination and critical thinking. The project also promotes mutual understanding and cultural exchange through the study and preservation of the Sahrawi rich astronomical traditions and knowledge of the sky. Amanar was selected as a &quot;Special Project&quot; of the International Astronomical Union (IAU) centenary celebrations, and has received funding from the IAU Office of Astronomy for Development and the Europlanet Funding Scheme. It counts with the support and collaboration of international astronomical institutions and a significant number of local partners. The first part was developed in three of the Canary Islands in summer 2019. It combined visits to the professional observatories with educational activities about the Universe and astronomical observations for the Sahrawi children who spend every summer in the islands together with Spanish families, within the long-standing &quot;Holidays in Peace&quot; program. The second part took place in October 2019, when a team of astrophysicists, science communicators and filmmakers visited the Sahrawi refugee camps in Tindouf to promote Astronomy outreach activities in schools and donate telescopes and educational materials. Teacher workshops were also organized to encourage educators to use Astronomy as a didactic tool and contribute to the improvement of the quality of education in the region. As a reaction to the COVID-19 Pandemic in 2020, the project provided follow-up capacity building for Sahrawi teachers through a pilot online training program through WhatsApp, which is efficient to low internet connection and easier to use in their mobile phones. The program content was co-created with the teachers to ensure that was relevant to them. In total, 645 children, 83 teachers and 150 people from the general public participated in all the project activities. In addition, thanks to a collaboration with the Sahrawi Oral History Department, a series of interviews were organized with elders about their Astronomical knowledge. In 2021 we are expanding this study by awarding internships to young Sahrawi people, who will be trained on Ethnoastronomy and ethnographic data collection, so they are the ones leading the process of preserving their own culture and history. In this talk, we will present the outcomes and best practices learned from the project so far, the planned actions to ensure long-term sustainability along with future visits to the camps. We will also discuss the global impact of this type of initiatives in the framework of Astronomy for Development. |
| Oral presentation | Pete Wheeler | Big bang media in an era of science journalist extinction — a cosmic press officer’s guide to astronomical media success. | The decline of science specialist journalists in Australia over the last ten years has created a challenging environment for press officers tasked with getting the work of their researchers and institutes into the headlines. What works and what doesn't? What are the essential ingredients for astronomical media success? Are there pros and cons for an almost complete loss of specialist science journalists? How do you take complex research and turn it into international headlines? In this presentation, I'll talk about what it takes to be successful in an era of news media driven by clickbait and time poor, underpaid, non-specialist journalists who can find it easier to give complex science a wide berth. In this presentation you will hear about: 1. How the media landscape has changed in Australia over the past ten years with respect to science reporting. 2. Which stories always play well, which are harder to sell, and what to do with the latter. 3. How to maximise media engagement and potential audience for an astronomical press release. |</p>
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<th>Oral presentation</th>
<th>Sinéad Mackle</th>
<th>Prof. Michael Burton</th>
<th>Keeping astronomy communication alive during a global lockdown</th>
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|                   | Doris Daou    | Planetary Defense Coordination Office at NASA HQ | NASA and its partners maintain a watch for near-Earth objects (NEOs), asteroids and comets that pass within Earth’s vicinity, as part of an ongoing effort to discover, catalog, and characterize these bodies and to determine if any pose an impact threat. NASA’s Planetary Defense Coordination Office (PDCO) is responsible for:  
   • Ensuring the early detection of potentially hazardous objects (PHOs) – asteroids and comets whose orbits are predicted to bring them within 0.05 astronomical units of Earth’s orbit; and of a size large enough to reach Earth’s surface – that is, greater than perhaps 30 to 50 meters;  
   • Tracking and characterizing PHOs and issuing warnings about potential impacts;  
   • Providing timely and accurate communications about PHOs; and  
   • Performing as a lead coordination node in U.S. Government planning for response to an actual impact threat. NASA’s currently congressionally-mandated objective is to detect, track, and catalogue at least 90 percent of NEOs equal to or greater than 140 meters in size by 2020, and characterize the physical properties of a subset representative of the entire population. This mandate will likely not be met given current resources dedicated to the task; however significant progress is being made. In this paper, we will report on the status of our program and the missions working to support our planetary defense coordination office. In addition, we will provide the latest detections and characterizations results. Our office continues to work diligently with our international partners to achieve our goals and continue to safeguard Earth with the latest technologies and tools available. |
| Oral presentation | Atharva Pathak, Arvind Paranjpye | Bringing out the “Awesome” in the Amateur Astronomers’ community | The Inter-University Centre for Astronomy and Astrophysics, (IUCAA) Pune, India has been supporting amateur astronomy activity in India whenever there has been a demand from local groups. We report how IUCAA’s very successful Muktangan Vidhyan Shodhika Associates (MViSA) programme for Amateur Astronomers was expanded nationwide during the pandemic lockdown and how it got a great response. Given the fact that amateur astronomers across the country were frustrated for being unable to step out and also had become more amenable to attending online events, IUCAA started a talk series as part of an initiative for promoting serious observational activities among the amateur community. A fortnightly series of lectures was organised which featured representatives of well-known projects or organisations across the world through which serious amateurs are significantly contributing to Science. The “Awesome Amateur Astronomy Talks” series was advertised and saw interested amateurs from all over the region and world registering too. With the interested numbers going up to 600 and about 100 joining our live interactions, the experience has been very inspiring to even for us! The initial introduction videos were unique in the fact that no one has yet put in efforts to connect dedicated amateurs to such serious projects all under one series. Given the diversity of topics from variable stars to lunar and planetary observations to meteor shower studies, The attendees now had the information support to make a choice of the niche area they want to contribute their regular observations to. They were in a way exposed to the concept of Citizen Science in which the citizen actually makes the observations. These talks are archived on our Youtube channel and will be followed up by activities selected by amateurs who may want to take up astronomy research at their convenience level. Further plans include open training from various project experts across the country. Theorpionist and the website of U.S. Government planning for response to an actual impact threat. NASA’s currently congressionally-mandated objective is to detect, track, and catalogue at least 90 percent of NEOs equal to or greater than 140 meters in size by 2020, and characterize the physical properties of a subset representative of the entire population. This mandate will likely not be met given current resources dedicated to the task; however significant progress is being made. In this paper, we will report on the status of our program and the missions working to support our planetary defense coordination office. In addition, we will provide the latest detections and characterizations results. Our office continues to work diligently with our international partners to achieve our goals and continue to safeguard Earth with the latest technologies and tools available. |

The Armagh Observatory and Planetarium (AOP) is dedicated to the public communication of science and astronomy. With the Observatory, which was established in 1795, we have been to the fore of astronomical research over four centuries. Our Planetarium has been operating for over fifty years and brings alive the communication of astronomy to the public. We are a small organisation but we are mighty in our astronomical communication and enthusiasm. During the pandemic we had to close our doors, of both Observatory and Planetarium. In fact, we have now been closed for a year (only opening for one week at Christmas for an outdoor event). When closing our doors we faced a huge challenge that would affect our staff and our visitors. Option 1 - we furlough staff and await better times to reopen, or Option 2 - we innovate and develop new programmes and we keep astronomy alive for the public. For our staff there was only one option and we set out upon a journey which indeed presented many challenges, but has also opened new doors and has shown us new and innovative ways to communicate, to build our audience, and has contributed to helping the community as well as staff development and mental health during this time. The lessons we have learned have helped us to adapt to working from home, but they are also lessons we are going to build upon when we do re-open. We will be utilising our new skills, new programming and using them alongside our traditional communication methods in a hybrid approach. Our presentation will communicate how we overcame challenges and built up our programmes, including detailing the successes, alongside lessons learned and how we adapted to make changes in the way we work and deliver astronomy communications. We will explain how we changed employee perceptions, built their confidence in technology, embraced change and how to use positivity in what has been at times a scary and changing environment. Our goal was to provide relief from the negativity that existed during the pandemic, encourage an uptake in astronomy and show how, in all the darkness, that the stars still shine and the Sun still will rise. Astronomy brings hope and optimism and these are what we have brought to our programming online. We have also helped parents with home-schooling in our online sessions and truly believe that we have been promoting STEM for all and giving all children a chance and the best start in life. Resilience has been a key theme at AOP and we have given staff the trust to work from home effectively, the tools they need and confidence that has aided astronomy communication to audiences. By doing this, you can create an inspiring organisation, one that audiences will endeavour to follow. In this paper we aim to present a live oral presentation delivered by members from our education teams. If our timezone does not suit, then we can pre-record the content. |
Oral presentation
Cintia Durán Xel-Ha López
SPACE LIBRARIES: How to use multidisciplinary approaches to reach vulnerable communities through astronomy and literature.
SPACE LIBRARIES: How to use multidisciplinary approaches to reach vulnerable communities through astronomy and literature. From the artistic-informative exercise Love Letter to a space rock, Cintia Durán turns into a new adventure in collaboration with Xel-Ha López, a young Mexican poet with whom she shares a friendship and the need to show the world of astronomy to remote communities in Mexico. From the said project, Space Libraries (Bibliotecas del Espacio) was born, an experimental education platform focused on planetary sciences and literature, where the main objective is to start conversations about astronomy, astrophysics, and literature, from creative writing exercises and literature focusing on two groups, which during the COVID-19 pandemic became vulnerable: boys and girls and elderly adults in Mexico. As a result of the pandemic, reflection in the community has become increasingly urgent, to think about how we relate to others, and how we understand collaboration and care. Space libraries have carried out seven workshops in three municipalities in the state of Jalisco, Mexico: Tlajomulco de Zúñiga, Ciudad Guzmán and Puerto Vallarta. We think that science is a tool to create community, capable of generating a network of knowledge together and learning in a more horizontal way, and for that reason we choose creative writing as an instrument, because it allows us to recognize ourselves, to know that our voice matters, our way to observe the world, to establish relationships with what surrounds us, to ask ourselves questions. In this project our main focus are rocks, from the earth to the formation of the solar system, they are the memory of unimaginable distances and are part of the history of the universe, which was and will be before and after each one of us, and like any library, are always ready to be consulted.

Oral presentation
Frederic Hessman
Taking Kepler's "Music of the Spheres" literally - solving the Mystery of the Exoplanets!
Kepler's idea of the "Harmony of the Spheres" - his explicitly musical model for how planetary systems work - can be used to create many kinds of playable scores, ranging from simple solo works to complete symphonies, given a computer program that converts planetary data into Western Musical notation so that normal musicians can play it. Amazingly, these musical models can tell us a lot about the dynamical stability of planetary systems. For example, Matt Russo has produced sonifications of the motions of the planets in the Trappist-1 planetary system (see https://www.system-sounds.com), however in a form that can only be shown as a (very impressive) video. By making such simulations accessible to a live music audience, I will show that any musical group can demonstrate how one can hear that only musically pleasant systems have a chance of long-term survival. Kepler was right after all!

Oral presentation
Stacey Habergham-Mawson, Andy Newsam, Susan Murabana, Chu Owen
Moonshot: An interactive app for Kenyan school students
The Covid-19 pandemic has exacerbated the need for technology to engage learners. Access to technology and the internet is not equal across, and within countries. This adds to the already unequal access to education, and more specifically engagement with astronomy. One thing, however, which is much more equal is access to smartphone technology, and in Kenya, school access to tablets. Here we will discuss the development of a comprehensive mobile application to be used to enhance science teaching in Kenyan schools. Not only can the app be used by students and their families in their home environments, but also on tablets, delivered to state schools since 2015 through a government scheme to engage students with technology. Although schools have tablets, they do not have reliable internet connections, so these are often under-utilised. Our app can be used offline following an initial download, allowing it to be used when internet is unavailable. We have chosen to base the app on the topic of the Moon to link to the Kenya curriculum, where topics such as Phases of the Moon and Eclipses are taught. This app is being developed in a partnership between the Travelling Telescope team in Kenya, and the National Schools’ Observatory (NSO) in the UK. The NSO will provide most of the content by repurposing resources available on their website. These include background information on the Moon, craters, eclipses, and tides; interactive activities and remote lunar observations which will be carried out by the Liverpool Telescope in La Palma. The Moon has also been chosen due to its conspicuousness. Although the dark skies and location of Qatar are key factors in the Travelling Telescope project, the Moon is always the most dominant feature. It can be observed without equipment and is bright enough to be viewed from inner city Nairobi as well as rural Kenya. The Travelling Telescope team will provide content for the app based upon their vast knowledge of hands on observing in Kenya. There will be elements throughout which also connect the learning taking place to local culture and environment. The app will take students on a journey to the Moon, learning about various aspects of the Moon’s geography, history, and effect on Earth. After learning about an aspect of the Moon students will then complete a ‘mission’ to obtain a crucial component for their rocket and ship which will culminate in their own Moon mission. Eventually, the Mars mission will be complete and range from science-based, maths, technology, to sport, art, and creativity. They are designed to allow students to express themselves and connect with their local place, and the night sky. Once complete, this app has the potential to be translated to other languages and used in other countries experiencing the same limited access to astronomy education.

Oral presentation
Hidehiko Agata, Sadanori Okamura, Toshirio Handa
Considerations for maintaining and updating academic terminology - The Internet Encyclopedia of Astronomy as a case study.
Globalization has resulted in academic terms generally being shared and updated in English by various academic societies. In primary and secondary education, however, it is often necessary for countries to translate basic academic terms into their native language. The Japanese Ministry of Education, Science and Culture played a central role in compiling and publishing glossaries for various academic fields until the 1990s, but that task is no longer being performed. As a case study for considering how we are addressing this issue, we report on the maintenance, management, and usage of the Internet Encyclopedia of Astronomy, published in 2018 by the Astronomical Society of Japan. Unlike books, online term databases are freely usable by anyone and provide many advantages, such as inclusion of multimedia, advanced search functions, and ongoing content updates. Through website traffic analysis and questionnaires, we find that this dictionary is increasingly being used not only by those involved in higher education, but also by those in primary and secondary education.

Oral presentation
Karen Masters
SDSS-IV Committee on Inclusion in SDSS (COINS) and Education, Public Outreach (EPO) groups.
The demographics of EPO participation among professional scientists in a large, international collaboration (the Sloan Digital Sky Surveys IV). The Sloan Digital Sky Survey (SDSS) is a large international collaboration of astronomers who make use of SDSS facilities to work on spectroscopic surveys of astronomical objects. In its fourth phase, SDSS-IV (2014-2021) made use of telescopes at both Apache Point Observatory in New Mexico, and Las Campanas in Chile to create the eBOSS, MaNGA and APOGEE-2 surveys. Roughly every two years the collaboration ran a demographics survey, in which members were invited to respond to various questions to help the COINS (the Committee on Inclusion in SDSS) monitor progress on inclusive efforts (Lundgren et al. 2015 published the 2014 snapshot). In both 2016 and 2018 these questions included a section on engagement with EPO (Education or Public Outreach). We will review the answers to these questions, which demonstrate that, in general, professional scientists in SDSS-IV believe spending time on EPO is important, but that the many competing demands on their time limit their ability to engage. The results reveal a gender disparity in who is more likely to volunteer for EPO, with non-male scientists in the collaboration being more likely to be highly engaged in EPO activities than male scientists.
This presentation will describe a campaign to promote STEM vocations among girls in Chile, and to increase the visibility of female professionals in STEM. Despite hosting many of the largest international observatories in the world, Chile lags behind most OECD and Latin American countries in terms of female participation and retention in STEM careers. The PROVOCa campaign focuses on role models to inspire girls and show them, and others who influence their career choices such as teachers and parents, that science is open to all and STEM careers are rewarding and within reach. At the same time, female role models are highlighted in the campaign and their voices as STEM communicators play a central part, in contrast to the famous male scientist figure typically portrayed. Short videos were produced after a face-to-face experience that brought together female STEM professionals and girls from underserved communities. These videos are being used in social and traditional media to showcase female role models in STEM, mirroring their stories with those of girls who aspire to pursue careers in these fields. A sample of these videos will be shared to illustrate the kinds of biases that need to be addressed to increase interest and participation of girls and women in STEM. At the same time, these biases influence and explain the lack of female voices in science and, in particular, in communicating astronomy. In each video, the role models explain in simple words their main line of work, while also sharing personal experiences that resonate with the stories of selected students in each episode. The videos have been produced in Spanish, with and without English subtitles, and in Chilean sign language. This additional step was taken to reach a wider audience and increase inclusion, recognizing the cultural heritage behind the language.

**Oral presentation**

| Sonia Dufau | Paulina Bocaz |
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| The PROVOCa Campaign |

**Oral presentation**

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<th>Cesare Pagano</th>
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<td>Unioni Astrofili Italiani</td>
<td>Alberto Andreis (Unioni Astrofili Italiani), Andrea Alimenti (Unioni Astrofili Italiani) (Dept. of Engineering, Università Roma Tre, Italy).</td>
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"Stars for All": the inclusion experience of the Italian Amateur Astronomers community

The passion that drives amateur astronomers (AA) in their activities has led to the flourishing of a dense network of associations committed to the inclusive astronomy outreach (IAO) in Italy. This session is meant to share this experience and its practical results. The International Year of Astronomy 2009 saw the first pioneer IAO experience in Italy by a local AA association [1]. Every year since then this association has held astronomy courses for the visually impaired, blind and deaf/blind people, as well as many public events with telescopes accessible to people with physical disabilities. In 2016, “Unione Astrofili Italiani” (UAI – Italian Amateur Astronomers Union) developed the “Stelle per Tutti” (“Stars for All”) project [2] to spread this experience across all the Italian AA associations. The project, co-funded by Italian Ministry of Labor and Social Policies, ran through 2017, involving 8 associations and delivering 17 events. This project worked as a starting flywheel for the Italian AA association network on IAO, grown to 20 active associations spread across all country. The success of this initiative is to be found first in the effort of UAI to evolve a local experience into a systematic nation-wide practice, now the UAI National Program for Inclusive Outreach (PNDI). The second winning factor is the wide geographic distribution of AA associations, with strong connection with the territory. The collaboration between these associations and blind people associations, care centres, clinics, schools allow a continuous and highly stimulating exchange of ideas. Thus, the designed teaching tools and methodologies are validated directly by the users and by the experts from national disabilities institutions. Due to the different specific needs related to visual, physical, hearing and cognitive disabilities, the national AA work group is organized in four subsections each one focused on a different disability category. The results of these activities are spread and shared among the Italian AA community in order to stimulate also all the other AA associations to organize IAO activities. This experience can be used as a reference for others about how AA can provide a fundamental contribution to the development of “practices that matter” for IAO. During the COVID-19 pandemic forced halt to activities, the AA community started experimenting online inclusive activities, with 3 activities performed so far of increasing complexity. The last one, an inclusive live re-broadcast of Mars2020 landing, has collected about 12k visualizations with strongly positive feedback from participants, and some interesting lessons learned. The UAI PNDI is an active contributor to the IAU Astronomy for Inclusion workgroup. REFERENCES [1] D’Amato, Watch the Earth: astronomia per non videnti ed privovidenti, Nuovo Orione n. 222 (2010), 66-67; European Blind Union (EBU) Office, Astronomy for the blind, EBU Newsletter 78 (2011) [2] https://bit.ly/3tbepLQ

**Oral presentation**

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<th>Kristen Metzger</th>
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Vera C. Rubin Observatory is developing its Public Outreach (PPO) program, and the EPO team is also making—and documenting—plans about where, what, and how we will communicate during Rubin Operations (scheduled to begin in 2023). Because the EPO program was included as part of Rubin Observatory’s Construction budget, we have the time and resources to thoughtfully develop our strategic communications infrastructure now, before the telescope is operational. This has allowed the EPO team to agree on and clearly define our goals and priorities, and to integrate some specific and novel elements into the documents that will guide our communications activities in operations. These elements include capitalizing on social media to intentionally find and engage with new audiences, and communicating in an approachable, informal style. A comprehensive strategic communications plan, a list of clear and concise key messages, and a documented “voice guideline” are three tools we are developing during construction to help us communicate consistently, and to remind us that we should always be thinking of new ways to inspire people with diverse backgrounds and perspectives to engage with Rubin Observatory. I will describe how we developed these tools, and how they will contribute to communications activities that are intentional and inclusive.

**Oral presentation**

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Astronomy as a tool for peace & diplomacy: experiences from the Columbia-Hypatia project

"Columbia-Hypatia: Astronomy for Peace" takes place on the divided island of Cyprus, and is a cross-disciplinary collaboration between Science Communicators (GalileoMobile) and Peace Educators (Association for Historical Dialogue and Research) in which astronomy is used as a tool for peace and diplomacy. The two main ethnic communities of the island, the Greek-Cypriots and Turkish-Cypriots have been living physically separated for over 45 years, in a post-conflict state. While communication between the two communities has increased since check-point openings in 2003, interaction remains sparse. The project engages children and educators from the two communities in the United Nations-controlled “buffer zone”, with educational astronomy activities, to inspire them to be curious about science and the cosmos, while also using astronomy as a tool for promoting meaningful communication, a Culture of Peace and Non-violence and to inspire a sense of global citizenship. We will share experiences and lessons learnt from the project as well as plans for future “Astronomy for Peace” collaborations in other post-conflict regions.

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"Stars for All": the inclusion experience of the Italian Amateur Astronomers community

The passion that drives amateur astronomers (AA) in their activities has led to the flourishing of a dense network of associations committed to the inclusive astronomy outreach (IAO) in Italy. This session is meant to share this experience and its practical results. The International Year of Astronomy 2009 saw the first pioneer IAO experience in Italy by a local AA association [1]. Every year since then this association has held astronomy courses for the visually impaired, blind and deaf/blind people, as well as many public events with telescopes accessible to people with physical disabilities. In 2016, “Unione Astrofili Italiani” (UAI – Italian Amateur Astronomers Union) developed the “Stelle per Tutti” (“Stars for All”) project [2] to spread this experience across all the Italian AA associations. The project, co-funded by Italian Ministry of Labor and Social Policies, ran through 2017, involving 8 associations and delivering 17 events. This project worked as a starting flywheel for the Italian AA association network on IAO, grown to 20 active associations spread across all country. The success of this initiative is to be found first in the effort of UAI to evolve a local experience into a systematic nation-wide practice, now the UAI National Program for Inclusive Outreach (PNDI). The second winning factor is the wide geographic distribution of AA associations, with strong connection with the territory. The collaboration between these associations and blind people associations, care centres, clinics, schools allow a continuous and highly stimulating exchange of ideas. Thus, the designed teaching tools and methodologies are validated directly by the users and by the experts from national disabilities institutions. Due to the different specific needs related to visual, physical, hearing and cognitive disabilities, the national AA work group is organized in four subsections each one focused on a different disability category. The results of these activities are spread and shared among the Italian AA community in order to stimulate also all the other AA associations to organize IAO activities. This experience can be used as a reference for others about how AA can provide a fundamental contribution to the development of “practices that matter” for IAO. During the COVID-19 pandemic forced halt to activities, the AA community started experimenting online inclusive activities, with 3 activities performed so far of increasing complexity. The last one, an inclusive live re-broadcast of Mars2020 landing, has collected about 12k visualizations with strongly positive feedback from participants, and some interesting lessons learned. The UAI PNDI is an active contributor to the IAU Astronomy for Inclusion workgroup. REFERENCES [1] D’Amato, Watch the Earth: astronomia per non videnti ed privovidenti, Nuovo Orione n. 222 (2010), 66-67; European Blind Union (EBU) Office, Astronomy for the blind, EBU Newsletter 78 (2011) [2] https://bit.ly/3tbepLQ

**Oral presentation**

<table>
<thead>
<tr>
<th>Kristen Metzger</th>
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<tr>
<td>Building Vera C. Rubin Observatory’s Communications Infrastructure to Reach New Audiences</td>
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Vera C. Rubin Observatory is developing its Public Outreach (PPO) program, and the EPO team is also making—and documenting—plans about where, what, and how we will communicate during Rubin Operations (scheduled to begin in 2023). Because the EPO program was included as part of Rubin Observatory’s Construction budget, we have the time and resources to thoughtfully develop our strategic communications infrastructure now, before the telescope is operational. This has allowed the EPO team to agree on and clearly define our goals and priorities, and to integrate some specific and novel elements into the documents that will guide our communications activities in operations. These elements include capitalizing on social media to intentionally find and engage with new audiences, and communicating in an approachable, informal style. A comprehensive strategic communications plan, a list of clear and concise key messages, and a documented “voice guideline” are three tools we are developing during construction to help us communicate consistently, and to remind us that we should always be thinking of new ways to inspire people with diverse backgrounds and perspectives to engage with Rubin Observatory. I will describe how we developed these tools, and how they will contribute to communications activities that are intentional and inclusive.

**Oral presentation**

<table>
<thead>
<tr>
<th>Francesca Fragkoudi</th>
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<td>GalileoMobile and AHDR</td>
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Astronomy as a tool for peace & diplomacy: experiences from the Columbia-Hypatia project

"Columbia-Hypatia: Astronomy for Peace" takes place on the divided island of Cyprus, and is a cross-disciplinary collaboration between Science Communicators (GalileoMobile) and Peace Educators (Association for Historical Dialogue and Research) in which astronomy is used as a tool for peace and diplomacy. The two main ethnic communities of the island, the Greek-Cypriots and Turkish-Cypriots have been living physically separated for over 45 years, in a post-conflict state. While communication between the two communities has increased since check-point openings in 2003, interaction remains sparse. The project engages children and educators from the two communities in the United Nations-controlled “buffer zone”, with educational astronomy activities, to inspire them to be curious about science and the cosmos, while also using astronomy as a tool for promoting meaningful communication, a Culture of Peace and Non-violence and to inspire a sense of global citizenship. We will share experiences and lessons learnt from the project as well as plans for future “Astronomy for Peace” collaborations in other post-conflict regions.
### Oral presentation

**Aneta Margraf Druc**
- **Pedro Russo and the Astronomy & Society Group**
- **Visual Approaches to Communicating Astronomy with the Public**

Over the years, the changing reality around us, the standards of social life and the development of societies give design graphics more and more importance. It affects the shaping of social awareness to an increasing extent and concerns a very wide area of communication between people. It is difficult to overestimate the role of design graphics - it accompanies us in every area of life - also in the communication of astronomy with the public. Astronomy focuses on many areas that require multidisciplinary skills to understand them. Communicating astronomy knowledge to people who are not qualified scientists or at least passionate about the subject requires appropriate communication skills and materials. This is where graphic design is indispensable. Graphic design has a very important role in the elements supporting the teaching and dissemination of knowledge about astronomy, but it also carries a lot of responsibility. First of all, it has to convey knowledge in an appropriate and substantive way. It is extremely important that the projects are visually attractive and tailored to the appropriate target group. Their appearance should be attractive enough to attract the viewer’s attention, interest them, amuse them or intrigue them. Content evaluation takes only a few seconds during which the recipient decides whether he or she is interested in the project. The choice of colors, typography, techniques, layout, and the consistency of elements determine the quality of the project. The graphic design should not interfere with the reception of content, it should be as simple as possible. Often, moderation and simplicity help the audience absorb content, especially in complex fields such as astronomy. During the presentation, I will present examples of projects related to astronomy and STEM. It will include animations, poster designs, banners, publications, prints and graphics for social media targeted at a range of audiences, from children to policy-makers. The audience will be able to see a wide variety of techniques and topics. They will be able to judge for themselves which way of communicating information is the best for them.

### Oral presentation

**Hidehiko Agata**
- **Lina Canas, Izumi, Izumi Hansen and Jorge Rivero Gonzalez**
- **Kaifu-NAOJ Telescope Kit: A Legacy of the IAU100 Celebrations**

The National Astronomical observatory of Japan (NAOJ) developed a small inexpensive assembly-type astronomical telescope kit. NAOJ hope to distribute it at a low price around the world – our goal is “One Family, One Telescope”. From July 2019, we started to distribution to all over the world. We call this project “You are Galileo!” project which is one of the projects of the IAU 100 years celebrations from Japan. This presentation will report on the results of using this telescope kit in elementary school classes in Japan. In remembrance of the former IAU President and NAOJ Director General, 251 telescopes have been distributed in 22 countries during 26 teacher trainings from OAO and IAU100 Committee. These trainings have brought telescopes to many students, allowing them to experience the wonders of astronomy with their teachers. In this way, we will report the achievements of IAU100 year and discuss the possibility of future development.

### Oral presentation

**Vaihav Savant**
- **Debarati Chatterjee**
- **LIGO-India: Education and Public Outreach (EPO) efforts**

LIGO-India is an upcoming advanced gravitational-wave observatory to be located in India as a part of the worldwide network for observing gravitational waves. A site near Aundha in the Hingoli district of Maharashtra state has been selected for this. The requirements of the project put it in a relatively isolated region that is in a nascent stage of economic and industrial development with a majority of the population engaged in agriculture as a source of livelihood. A LIGO-India EPO (LIEPO) team was constituted to assess and address the unique requirements of EPO of the project at three levels - local, national and international. The team has been working actively in the surrounding regions of Hingoli for the past year while also engaging interested people across the country and the world. We present here the various initiatives undertaken, the unique challenges faced and the impact of the activities in light of the pandemic. We also welcome ideas and collaborations based on these.

### Oral presentation

**Thiago S Goncalves**
- **Marcelo Rubinho**
- **Astro+- an institutional initiative for science communication**

In this presentation I will show the results of our “Astro+-” initiative to communicate astronomy through social media platforms, while at the same time representing the Brazilian academic community as a whole. While the idea itself is not novel, the project is not as straightforward as one might think due to the lack of a Public Information Office for the Brazilian Astronomical Society. Therefore, our strategy was to gather existing outreach initiatives led mostly by graduate students, and coordinate efforts under the society. This has been used as a way to show the public (mostly on the age group of 18-34 y) the existing research in the country, and facilitate a dialogue in a manner strongly adopted by social media users. The first half of the project is done in a partnership with the Astrotubers, a group of students who discuss topics related to astrophysics in their Youtube channel. With over 50,000 subscribers, they have great potential to reach a wide audience. The other branch is done mostly through Twitter, which has the major benefit of encouraging a two-way dialogue with the target audience. Our posts have been a great success, with many of them reaching an audience of over 100,000 viewers and millions of accesses collectively, and very high engagement rates. The project has the financial support of the Serrapilheira Institute, a private funding agency in Brazil, and this has allowed the team to overcome barriers such as the lack of funds for simple tools such as recording equipment and editing services for the videos. Therefore, we are now in a position to allow for a productive interaction between the astrophysics researchers and the general audience, in a way that was previously impossible in our country due to the lack of infrastructure and support for institutional outreach initiatives. Finally, I will discuss the challenges faced by the project in the near future, regarding the financing situation and the sustainability of this initiative in the mid- to long- term.

### Oral presentation

**David Prosper**
- **Astronomy Clubs Outreach Efforts During a Pandemic: Lessons Learned Going Forward from members of the NASA Night Sky Network**

How has the nature of astronomy outreach performed by astronomy clubs since early 2020? Restrictions brought by the pandemic have forced many volunteer outreach efforts online, with in-person events drastically curtailed. Some changes have had unexpected positive developments; in many cases, membership in clubs has increased as interest in stargazing and astronomy has exploded from folks stuck at home and looking up. Club members have also learned many new technologies as part of their efforts, including broadcasting live views from their telescopes across many streaming platforms and projecting live views from their eyepieces at in-person events rather than share eyepieces and help maintain social distancing. As restrictions are lifted, some of these practices may continue in some form. This talk will discuss the challenges faced by astronomy clubs during this time and how some of the lessons learned during this time can be successfully used going forward and strengthen their efforts to both bring astronomy to the ever wider audiences and increase and retain their own membership.
Oral presentation  Magdalena Kersting  Rolf Steier, Grady Venville  Exploring participant engagement during an astrophysics virtual reality experience at a science festival  Virtual reality applications turn abstract concepts into experienceable phenomena and present exciting opportunities to transform science education and public outreach practices. While research has started to look into the affordances of virtual reality (VR) in the formal science education context, the potential of these technologies to enhance public engagement with science is largely unexplored. To improve the way that VR may be used in informal learning and public outreach contexts, the purpose of our study was to undertake evidence-based investigations that explore the relationship between VR and public engagement. Aiming to identify and develop the benefits of VR technologies, we propose a conceptual framework for engagement with VR at a science festival that comprises four aspects of participant activity: immersion, facilitation, collaboration, and visualisation. This framework guided the research design of our exploratory case study of one VR tour at a science festival. Data included visitor surveys, video recordings, VR screen captures, and focus group interviews with outreach and science professionals. Our findings reveal important ways that VR supports visitor engagement at a science festival. More generally, these findings and our framework contribute to the ongoing efforts of engaging the public with science in more diverse informal learning contexts.

Oral presentation  Sanjula Thiranjaya  Dhamshith WEERASINGHE, Ashan ARIYAWANSA, Asanka RAJAPAKSE, Madhura COORAY, Himantha OSHADA, Sunera SOMABANDU, Anupa PERERA  The “Ring of Fire” eclipse day – A nationwide project to observe the annular solar eclipse of the decade on 26.12.2019 from Sri Lanka  The project “Ring of Fire” eclipse day, was carried out on boxing day 2019 at five locations in Sri Lanka, covering social groups of diverse cultural and ethnic backgrounds. The solar eclipse was best viewed from the northern and the eastern parts of the island. Therefore, the main eclipse observation event was carried out in Kaddaiakul Roman Catholic Tamil Mixed School in Jaffna. A teacher training program was also organized in parallel to the eclipse event in Jaffna. The other four groups that observed the eclipse was, from St. Joseph College in Anuradhapura, Central College in Kanthale, Hillwood College in Kandy and Nalanda College in Colombo. The eclipse was observed, and experimental data was shared with more than 2000 students, teachers and general public around Sri Lanka. The project was funded under IAU “Open Astronomy Schools” projects. This was a unique opportunity for students, teachers and the organizers to use Astronomy and Science to share knowledge and bridge cultures distantly through other external factors. Also, an emphasis was given to tackle misconceptions and superstitions among the general public related to eclipses by means of engaging students and teachers to engage with the general public.

Oral presentation  Fatihah Shahwiya  Satria Ramadhan, Chandra Fernandez, Adi Hutaisoit, Beta Falah, Radyta Pramukti, Hasanain Alfiansyah  Astronomy for Wider Community : Creating A User Friendly Online Education Platform for People with Disabilities  The start of pandemic has made a lot of demands in technological innovations in order to adapt to quarantine, one of the most affected is education system. We are required to continue to innovate and adapt with technology to keep education accessible for everyone. There have been many media / platforms that organize online classes for various groups, from early education to university students. However, there are still many students, especially in Indonesia who have not been able to catch up with the innovation in learning process, one of which is those with physical disabilities. Himastron ITB as the first student-led astronomy association in Indonesia took the initiative to create a platform as a learning medium that is user-friendly to everyone, including people with disabilities. So that they can enjoy the convenience of accessing astronomical knowledge with the help of technology anytime.

Oral presentation  Natalia Ruiz Zelmanovitch  Manuel Gonzalez, Mario Pelaez Fernandez; Paula del Rio Manzanas; Nieves Garcia Corpas; Mikel Herran Subihas; Arcadi Garcia; Maite Alonso; Adrián Garcia; Clara Grima; Gemma del Caño; Conchi Lillo; Manián Garcia; Teresa Valdés-Solis; Inma Pérez & Francisco Jesús Martinez; Francisco Gemici  #CienciaVisión2020, a Science Eurovision home-made and made from home.  In March 2020 we received with sadness the news that the Eurovision contest was cancelled. Of course, it was common sense. But a group of people found the urgent need to do something about it. And while I was proposing to Manuel Gonzalez, an astrophysicist and astrocoplero artist, to do something, another group of people was up to exactly the same thing. And, after connecting through twitter, we gathered some by videoconference to organize ourselves from our respective confines. We are a group of people, lovers of music, feminists, LGBTQIQ, defenders of the importance of science and its dissemination, especially if it is a little (or very) glittered and with sense of humor. We had some crazy ideas snoring for a long time, so we said: “let’s try it”. And, surprisingly, the experiment came out. First, we selected a limited number of participants (most of the organizers plus several scientists, researchers, journalists, public information officers, etc., in total 14 songs) who had to choose a song previously performed at some point in the history of Eurovision, cover it with scientific lyrics, make a video and send it to us. The team organized the presentation, the videos previously sent by the participants, the on live presentations by themselves, and, finally, the poll from the public. We prepared it in ten days, with all the limitations of our own tools (mainly, mobile phones). It was, from the organizing point of view, almost like a decentralized television program. On Saturday 28th March 2020 we went live through the Scenio’s Twitch platform, that supported us, with #CienciaVisión2020. And we had around one thousand people as public on live during three hours. The organization team was composed by Natalia Ruiz Zelmanovitch (@bynzelman), public information officer at the Fundamental Physics Institute (CSIC); Mario Pelaez Fernández (@sassyscience_), post-doctoral researcher at the Instituto de Nanociencia y Materiales de Aragón and creator of The SassyScience Project, a sci-comm initiative bringing drag and science together; Paula del Rio Manzanas (@hayquehacerla), neuroscience student at University of Salamanca, queen of science and memes; Manuel González (@Manolox4444), astronomer at the communication department of the Institute of Astrophysics of Andalucía (CSIC), creator of the Astrocopla; Nieves G. Corpas (@Nebesu_), biologist and high school teacher, member of the Scienio scientific community, leading the organization of outreach on Twitch through the ScenioTv channel; Mikel Herrán Subihas (@PutoMikel), PhD in archaeology, University of Leicester, with a Youtube Channel, “PutoMikel”); and radio programs; Arcadi Garcia (@garirius), physicist, divo scientific dissemination. Master's Degree in New Electronic and Photonic Technologies, on TipTop Physics and ScenioTv, El Aleph, MinuteEarth and on TV with Celebrity School; Maite Alonso (@maitecieleta) English Teacher and expert in organizing scientific outreach events. Collaborators: @cienciascenario and @sceníov.  

Oral presentation  Natalia Ruiz Zelmanovitch  Manuel Gonzalez, Mario Pelaez Fernandez; Paula del Rio Manzanas; Nieves Garcia Corpas; Mikel Herran Subihas; Arcadi Garcia; Maite Alonso; Adrián Garcia; Clara Grima; Gemma del Caño; Conchi Lillo; Manián Garcia; Teresa Valdés-Solis; Inma Pérez & Francisco Jesús Martinez; Francisco Gemici  #CienciaVisión2020, a Science Eurovision home-made and made from...
Oral presentation Sanjula Thiranjaya Dharmish WEERASINGHE, Ashan ARYAWANSA, Anura RAJAPAKSE, Asiri LIYANAGE, Shashirekha NUWAN, Eranga AMARASINGHE, Shashika DULANGA, Madhura COORAY, Avishka DILHARA, Devin YASITH

IAU100 Special Project "Dumbara Sky" - Taking Astronomy to the Sri Lankan Village

The project "Dumbara Sky", organized as a special project for IAU100, was carried out to up bring the science awareness and to promote interest in STEM fields among students in two schools in the most remote villages in Sri Lanka, namely the Rambukwella Junior School in Ududumbara and the Kaikawala Junior School in Meemure. About 350 students participated in both the events along with 12 school teachers and 150 local villagers. The event went throughout the whole night and the students took part in various activities including assembling and handling telescopes, observation of celestial objects and building water boost bottle rockets, and also in sun observations through H-Alpha telescope on the next morning. A major emphasis was given on the fact that the skies that these villages have are the darkest ones in Sri Lanka due to its remoteness. The event created a stage to discuss and raise the awareness of protecting dark skies with sustainable lighting practices of roads and homes. Since the night sky is a laboratory shared by all the people on earth, astronomy outreach is a more promising way to connect with distanced communities and increase the interest of the students in these areas in STEM.

Oral presentation Francisco Rodriguez

We are (virtually) open! public visits to ESO observatories during COVID times

The public visit program to ESO sites is a very popular activity in Chile: 8,000 visitors each year travel across the Atacama Desert to see the ESO telescopes. On March 2020, as COVID-19 was spreading globally, to ensure the safety of its staff and the public, ESO decided to suspend all public visits to ESO’s La Silla and Paranal observatories. Three months later, we officially launched the ESO virtual guided tour program. Thanks to this initiative, people from around the world virtually visit (via YouTube and Facebook) the main spots of ESO’s observatories in Chile through ESO VR Tours available at eso.org. The experience is guided by two people (one guide and one producer) and broadcast through ESO’s social media channels. The interaction between the guides is similar to a podcast/video cast. The hosts pull out the audience’s questions and comments across the broadcast. As an extra, the experience can include astronomy talks or Q&A session with ESO staff. Each tour last 60 minutes including 10-20 minutes of questions. During 2020, ESO COMM offered 72 tours (English and Spanish) with an audience of 6,800 live viewers.

Oral presentation Oriana Trejo Alvarez

Astronomical Workshops: A complementary tool for online education

The pandemic generated by COVID-19 has forced us to adapt our reality to the new normal and astronomy, an area where we are used to face-to-face activities and right-time observations, is no exception. However, astronomy has a special virtue that sets it apart from other areas: the opportunity to visit new worlds, explore the cosmos and learn, from the comfort of your home. This same virtue makes it a fundamental tool for distance education and a means through which students can forget for a moment the confinement with which they are subjected and the distance that separates them. Taking this as a basis, throughout 2020 and in conjunction with Eurek’a Mexican civil association that seeks to bring astronomy to girls, boys and young people from an early age, through digital platforms, we generate astronomical camps with a duration of three weeks in which the small crew members were transformed into cosmonauts and through missions, in which through workshops, conferences and the use of digital media, they explored topics such as cosmology, astrobiology, scientific communication, space exploration, DNA among others. Throughout a year we had the participation of more than 300 students between the ages of 3 and 12 from different states of Mexico as well as from various Latin American countries. In a complementary way, I have collaborated with Mexican schools to generate workshops and conferences around astronomy, which make it possible to strengthen the topics seen in class and contained in the study plans, maintain interest in online classes and foster creativity and imagination.

Oral presentation Alessandra Ziaccari (INAF Istituto Nazionale di Astrofisica) Laura Dianello (INAF OAPA) and Chiara di Benedetto (Bas Bleu Illustration)

Second star to the right - A cultural project connecting art, tourism, history and astronomy

The Astro-tourism project of Istituto Nazionale di Astrofisica, stemming from a long-lasting research work in history of science by the INAF Observatories involved, is a very original communication project aimed at involving different audiences and various interests. It has undoubtedly some of the most visited and touristic places in the world; since very ancient times, through the Middle Age and then Renaissance and later, many of the major monuments were impressively connected to Astronomy: Science in fact was considered a most relevant part of the greatness and cultural identity of the cities themselves, was connected to Religion and marked daily life. Monuments such as the world-famous Brunelleschi Dome of the Cathedral of Florence or the Giotto’s Scrovegni Chapel in Padua, or the Royal Norman Palace in Palermo reveal stunning astronomical contents (namely: the world tallest sundial, the Halley comet painted in the Nativity and the telescope used for the discovery of the first asteroid in history). Walking downtown in the historic cities we will find clocks, meridian lines, Zodiacs, painted skies and constellations, ancient geographical maps, places connected to scientists such as Galileo Galilei or great explorers such as Amerigo Vespucci…. Masterpieces of art that contain “astronomical secrets”, instruments with an ancient charm that undoubtedly unveil the importance that the study of the sky and its movements always had for mankind. We will present the different media we used to connect Art, History, Science and Technology: • The astronomical guidebooks “Second star to the right” of Padua (2015), Florence (2019) and Palermo (presumably end of 2020): a series of attractive, simple, and not-specialist guidebooks describing the Astronomy content of many major monuments and places connected to past and actual science. They have a nice appealing graphic look, an easy format, and are full of curiosities and simple explanations, leading the visitors to search for Science into artistic masterpieces, historical monuments, churches, museums, places that tell us about illustrious scientists and current research. The books help the visitors follow different colored routes, for different themes (e.g. the measuring time; following Galileo or other important astronomers footprints; representing earth and sky; etc.); • A map and itineraries (again different colored routes, for the different themes) to autonomously explore those astronomical places; • Events such as walking tours with the astronomer, family activities, students’ visits, and laboratories, etc.; events carried out in collaboration with the relevant institutions (Churches, Museums, etc) creating new important cultural synergies locally. • A different guidebook, specifically addressing children and families with graphic elements and illustrations; • Virtual reality enhancements, Zap code, App deepening: different communication languages to attract different and diverse publics.
Oral presentation

**Andy Newsam**

**Solstick: an experiment in collaborative education during the pandemic.**

One of the biggest challenges during the enforced switch to online education during the Covid-19 pandemic was to ensure that those with relatively limited access to suitable internet technology (laptops, tablets etc) or restricted bandwidth were not overly disadvantaged. For formal education this was often done by schools and teachers creating and distributing physical materials (printouts, materials for experiments and so on) but this was not suitable for informal education or national projects, particularly on short timescales. Therefore, at the National Schools' Observatory (NSO) in conjunction with the Royal Astronomical Society (RAS) we decided to create a simple national experiment around the 2020 summer solstice with the aim of using astronomy to provide some enjoyment and encourage sharing while minimising (though not removing) the need for internet access and "screen time". Given the known benefits of fresh air, especially during stressful times, we also wanted to encourage families to get outside together even if they had limited space, so needed a project that would be best done outside (though did not require it). The results was the "Solstick" experiment. In this presentation we will describe the design and motivation of the experiment and discuss how far it went in achieving its aims, and the lessons learnt for similar collaborative, open experimental projects.

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Oral presentation

**Anton Binneman**

**Bob Eccles; Isidro, Mathieu**

**Preparing for the SKA: Communicating Radio Astronomy to a Multi-National audience with a focus on communities surrounding the SKA site**

The SKA will be the largest telescope of its kind in the world. Humanity could expect a number of scientific findings and advances from the project, that could potentially impact humanity in ways not even imagined yet. In preparation for construction of the instrument numerous Science engagement activities profiling Radio Astronomy are conducted to ensure that communities and countries buy in to the project and understand what it is about. Communicating Radio Astronomy Science in a single country and being inclusive is viewed a challenging endeavour by communications specialists. The SKA Project will have infrastructure on three continents and involves partners from all over the world. This Paper will focus on how the host countries the UK, Australia and South Africa, approach the challenge of engaging communities and communicating science relating to the project and how these activities are guided by the SKA communications and engagement framework. This diverse approach to communication and science engagement within the SKA will be highlighted with focus on the differences and similarities between the partner countries in their engagement with the public.

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Oral presentation

**Silvia Casu**

**Instituto Nazionale di Astrofisica (INAF)**

**Marco Pontis, Università di Bolzano**

**INAF WG "Inclusion"**

**The use in astronomy of social stories for people with autism spectrum disorders.**

Social Stories are a tool devised by Carol Gray in 1991 to improve the social skills of people with autism spectrum disorders offering a model to refer for appropriate social interaction. They do this by describing a situation, giving appropriate role models, presenting the perspectives of others, and suggesting appropriate responses to the situations presented. They could extremely useful tools in informing children about what they can expect and what is expected from them, for example during astronomy laboratory activities or during a Planetarium show. They are also helpful in reassuring, both socially and emotionally, the person for whom they are written. We here present the use the reasons for using social stories in Astronomy education activities and describe a particular application to be used by Planetarium operators.

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Oral presentation

**Chad Smith**

**Timothy Rhue, Alex Lockwood, Quyen Hart, Samuel Silverman**

**WebbVR: The James Webb Space Telescope Virtual Experience**

Come explore black holes, stars, disks, exoplanets and the Solar System with the future James Webb Space Telescope – all in virtual reality [VR]! Learn about the fully immersive WebbVR environment during our virtual demonstration, which includes exploring the James Webb Space Telescope, flying around the solar system, launching stars into a super massive blackhole, and discovering distant exoplanets. We will discuss the various design decisions that address challenges surrounding augmented reality communication. These challenges include realistically simulating space, conveying key astronomy concepts, player accessibility, self-guided tours, and much more. WebbVR is developed by the Space Telescope Science Institute in partnership with Northrop Grumman. WebbVR's development team consists of science experts, educators, designers and software developers whom aspire to create an immersive interactive education experience for the public. We will also share the many ways in which we use WebbVR during outreach events and how you yourself can use WebbVR whether for personal use, events, or to teach particular concepts. There are many ways WebbVR can be used to have fun, learn and enrich peoples lives. WebbVR is available for free through Steam games and compatible with Oculus and HTC Vive headsets. No virtual reality equipment required for this presentation.

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Oral presentation

**Rob O’ Sullivan**

**Dr Niall Smith, Danielle Wilcox**

**Opportunity in Crisis - Science Communication in Times of Hardship**

Communicating astronomy in the context of a global pandemic is a particular challenge given the nature of traditional outreach measures. Respecting social distancing and limiting shared contact with surfaces is difficult if not impossible in enclosed planetaria, or while sharing telescopes among members of the public. The face-to-face nature of traditional astronomy outreach was disrupted almost overnight and left many in the global community struggling to adjust to these new challenges. While overcoming these challenges has placed a significant burden on the science communication community, it also presented a unique opportunity to experiment with new approaches that simultaneously address problems that will continue to persist even after the Covid 19 pandemic has been abated. A key example is the delivery of outreach to communities who have been underserved due to geographical isolation and resource centralisation. In learning to deliver outreach via online channels and other socially distanced means during the pandemic, communicators have laid the foundations to continue to engage with these communities in a post-Covid world. Face-to-face delivery and online delivery each have their merits and drawbacks, but the two need not be mutually exclusive. Online delivery platforms can comfortably supplement the impact of traditional delivery rather than serving as a substitute for it. Developing such online platforms requires an initial investment in training, research, and development, but the investment can serve to magnify and maximise reach with minimal additional effort. As coordinators for Space Week Ireland, MTU Blackrock Observatory became the first National STEM Week in Ireland to be planned and delivered entirely within the restricted environment of the Covid 19 pandemic. As such Space Week became a de facto case study in how to deliver and succeed in outreach activity under unprecedented hardship. Not only did Space Week Ireland 2020 meet targets, but it vastly exceeded them and built on the success of previous years, reaching in excess of 87,000 people. This success was nationally significant, but also placed Ireland in the top 3 countries globally for running World Space Week events. The lessons learned in delivering Space Week during the Covid 19 pandemic have served to inform the outreach strategy of MTU Blackrock Castle Observatory since the onset of the pandemic. This talk will delve further into the approaches taken and how to adapt a STEM program to meet some of the challenges of science communication in a pandemic and beyond.
| Oral presentation | Vudhiaktos Pramudya | Yoga Dwi Prabowo, Lukmanul Hakim, Ricka Tanzilla, Wahyu Saputra, Muhammad Ihsan | Qibla Direction Determination using Sun Culmination at Mecca Zenith as Community Empowerment Program in Hybrid Mode | Islamic prayer needs to know Mecca’s direction accurately since it is mandatory facing the Qibla direction. There are many mosques in Indonesia still facing off-direction. It is due to a lack of understanding of astronomical methods to calculate the direction between two locations. Besides that, the true north needs to be determined accurately. However, this method usually challenging to be performed since there is a limitation of the instruments. The master students of physics education at Universitas Ahmad Dahlan (UAD) have an assignment to compose the community empowerment program. They utilize astronomy knowledge to create a tutorial video on the Qibla determination using sun culmination at Mecca Zenith. Twice a year, the sun will be at the zenith of Mecca. By observing the sun’s direction from a particular location in Indonesia, the observers can determine the Qibla direction. It is a simple and inexpensive method. However, there is a limitation due to the sun altitude in the east part of Indonesia. The tutorial video is uploaded to YouTube in order to reach a broader community to apply this method. A student was also giving a short lecture about the phenomenon of sun culmination to the local community. Hence, they can accomplish their assignment to communicate astronomy applications to the community using online methods via video and a short offline lecture. This method is helpful to be performed, especially during the covid-19 pandemic. |
| Oral presentation | Ric Alling, Alicia Hyatt, Sphurti Kachare, Alex Blanche, Patrick Young | Community Connections: Pivoting to Virtual During the Pandemic | The headquarters of Arizona State University’s School of Earth and Space Exploration includes public facing, interactive spaces and exhibits that deliver informal science education featuring exploration and discovery themes. Public outreach is a stated priority of the institution; pre-Covid we had built our annual, onsite attendance in excess of 30,000 multi-generational visitors. A point of pride of our outreach approach is the emphasis on facilitated programing. While we do provide access to traditional science lectures, most of our visitors enjoy live narrated simulations of earth and space science themes using innovative 3D technology. Guests can wander through galleries in a self-paced format, yet the majority of our visitors are led by student docents empowered to bring their own passion for their chosen field of interest to their presentation of science themes. Our outreach program, centered on contemporary exploration and research content, is in fact a designed to be human engagement experience. We document our decision making as we reacted to the sudden pandemic lockdown beginning in March, 2020. How does an institution with a fully developed on-site informal learning mission remain relevant as a community asset in a virtual world? We describe the development of a program we call ‘Virtual Night Sky’, an episodic broadcast that is designed to make lasting community connections during an unprecedented period of pandemic imposed self-isolation. We will reflect on issues of technology, audience development, inclusion, relevance and impact. |
| Oral presentation | Victor Vera Teofilo Vargas, Liseth Gonzales and Hugo Loyo. | Legacy of the IAU100 Celebrations in Peru | We present a summary of the efforts made by our Peruvian Outreach Coordination Committee to launch a series of educational and outreach projects, related to the celebrations of the 100 years of the International Astronomical Union. Some of them, worldwide events, such as Name ExoWorlds, 100 Hours of Astronomy, Women in Astronomy, Moon Landing 50th Anniversary and Telescopes for All; and others, taking place at national, such as the Peruvian Olympiads on Astronomy and Astronautics and our emblematic Astronomical Fridays, the longest running series of outreach talks in the history of Peru, which became a Special Project for the IAU100 celebrations. In the same way, we highlight how these efforts have contributed to best practices on astronomy outreach and education in our country, and also to strengthening relationships between educators, amateurs and professional astronomers, leaving a legacy for future collaborations between our national institutions, in search of sustainable development of Peruvian astronomy at all educational levels; which helped us to face the difficult times of the Pandemic in the best possible way. |
| Oral presentation | Cintia Durán | To think like a planet: Approaches to the dissemination of the study of the sky from pre-Hispanic indigenous practices and the importance of oral tradition in the communication of science in Mexico. | To think like a planet: Approaches to the dissemination of the study of the sky from pre-Hispanic indigenous practices and the importance of oral tradition in the communication of science in Mexico. By Cintia Durán. What is Earth exactly? A planet, a rock spinning in space, a home. In Nahuatl The place where there is fire, and therefore, there is heat, is called “Chantequitl” and at the same time the word assigned for home is “Chantli”. The Earth, that chaotic and mutant place that protects us, is seen in many cultures as a living, divine entity that feels and decides for us. From planetary sciences specifically geology, rocks bear witness to events that happened millions of years ago, the study of “geological time” is essential to know our home and ourselves. Human culture has observed the earth and the sky since we began to become aware, what were rocks, clouds, rain, wind like in those days? What is different in the way we observe and investigate now? “To think like a planet” is a series of astronomical and atmospheric observation exercises in collaboration with scholars of the Nahua language (the most important indigenous language spoken in Mexico) to create short spoken stories about the sky of different neighborhoods in Mexico City. Today, the development of science opens new paths for us, many of them on the foundations and excavations of women and men before us, who from curiosity and work have managed to reach essential conclusions. Science and technological advancement give us unbeatable advantage over our ancestors, but even this "scientific knowledge" is caught between the barriers of language, culture, economics, social discrimination and the erroneous idea that science is only learned in “school”. Thinking like a planet” aims to retake customs and foundations of indigenous Mexican astronomical observation, adapting it to different neighborhoods and communities in Mexico City. |
Oral presentation

Jorge Rivero González, Lina Canas, Bethany Downer, Pedro Russo and Ewine van Dishoeck

IAU 100th Anniversary Celebrations: Lessons Learnt and Challenges of Planning and Coordinating a Global Public Engagement Initiative

The International Astronomical Union centenary celebrations (IAU100) in 2019 comprised a year-long worldwide public engagement initiative that celebrated the fascinating past century of astronomical discoveries as well as the importance of astronomy for education, development, diplomacy and outreach. Through the coordination of the IAU100 Secretariat and the IAU Office for Astronomy Outreach (OAO), a combined worldwide effort from the IAU National Outreach Coordinators (NOCs) network, IAU bodies, astronomical organisations, amateur astronomers, teachers, science centres and planetariums implemented the IAU100 ambitious goals.

IAU100 exceeded initial expectations with over 5000 registered activities in 143 countries with an estimated further reach of 100 million people through communication activities (see IAU 100th Anniversary Celebrations Final Report). Among the global initiatives organised, we can highlight the IAU100 NameExoWorlds comprising 114 national campaigns to provide names to a star and exoplanet systems; the IAU100 Moon Landing 50 Global Project was the largest coordinated action worldwide celebrating the Moon landing 50th anniversary in 128 countries and regions; and the Above and Beyond open-source exhibition, which showcases the past century of fascinating astronomical discoveries and was on display in more than 75 countries. IAU100 also supported 21 Special Projects awarded with micro-grants to organise national and local initiatives. On Rivero Gonzalez et al (2020), lessons learnt and challenges of planning and coordinating IAU100 have been discussed. For instance, the approach and methodology employed by the wide participation of grassroots organisations. Moreover, the IAU100 also benefited the NOCs network, both by the increase in the number of countries involved and its levels of engagement. An exploratory study about the impact on the network helped us better understand the impact and stress on the national representatives, highlighting the type of activities and numbers of them that could be sustainable in the future. IAU100 was challenging given the limited time and resources. It would have benefitted from more time to develop different phases of the project, especially its evaluation. In this sense, further work has been done to analyze the overall activities implemented as well as a comprehensive study of social media interactions through sentiment analysis. Finally, the IAU100 legacy is kept alive by the IAU100 Global Projects, annual programmes initiated as IAU100 Global Projects, Special Projects or other kinds of local grassroots activities. In this contribution, we will present an overview of the IAU100 initiative. By discussing its implementation, impact, major highlights, legacy, and lessons learnt, we will present best practices to develop similar transnational large-scale public engagement activities.

Oral presentation

Martin Hendry

LIGO Scientific Collaboration, Virgo Collaboration and KAGRA Collaboration

Communicating the excitement of gravitational-wave astronomy to diverse, global audiences

Gravitational-wave astronomy is an exciting new field which over the past five years has achieved a very high public profile, as the global network of ground-based gravitational-wave detectors have made a series of remarkable discoveries. This field involves science and technology that is widely perceived as fascinating – spanning topics that range from black holes, relativity and fundamental physics to ultra-precise lasers and high-performance computing. However, the highly specialized and esoteric nature of much of this science and technology presents a challenge for communicating the excitement and successes of gravitational-wave astronomy to a truly inclusive way. We seek not just to engage formaulas but as active participants, who recognize the relevance and importance of gravitational-wave astronomy in their lives and can e.g. visualize themselves as following study and career paths within our global scientific community. Since the first gravitational-wave detection in 2015, which was awarded the Nobel Prize in Physics in 2017, the Education and Outreach teams of the LIGO Scientific Collaboration, Virgo Collaboration and KAGRA Collaboration have sought to communicate the emerging story of gravitational-wave astronomy through a broad program of informative, engaging and inclusive activities. Our goals have been to convey the excitement of our new field, and the diverse global community that enables us to do it. We aim to share the science and the scientists behind the story, and through this, to offer a window into how science works – particularly in the context of international collaborations and projects that requires many decades of patient investment and coordinated teams of thousands of people. This presentation will highlight and discuss a number of the outreach activities that have been pioneered by our collaborations as we seek to bring gravitational-wave astronomy to a diverse, global audience. Key examples include: • our educational publications and resources, and how we use them to recognize and embrace diverse languages, cultures and traditions; • our workshops, activities and educational materials that support under-represented groups and resonate with broader aspects of popular culture; • our social media and social media that are building bridges between science and the arts, and showcase the rich diversity of our scientific community. Finally, this presentation will seek to draw parallels with the communications challenges facing other global astronomy and physics projects and identify areas in which our communities could work together more closely in the future.

Oral presentation

Anita Zanella

The Audible Universe

In modern times, 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. Despite the fascination in our Universe, 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”. For example, only by using giant telescopes we can detect exoplanets or distant galaxies. Furthermore, most physical processes in the Universe reveal themselves, not in visible light, but instead at other wavelengths invisible to humans, including: radio waves; X-rays; and gamma rays. Incredibly, 95% of the mass-energy budget of the Universe is actually entirely “dark” because it does not emit radiation and is referred to as “dark matter” and “dark energy”. Despite the fact that we are all basically blind to the Universe we nearly always opt to represent the data with visuals. 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 phenomena into sound. There are now several astronomers performing such “sonification” of astronomical data to make academic research, outreach and education accessible to people who are blind or visually impaired (BVI) or to assessing if data sonification, used in tandem with visualisations, can enable a deeper understanding of the underlying data. Although there is a growing interest in this research area, scientific sonification software often fails to meet even basic accessibility criteria set out by the International Organization for Standardization, and is far from having rigorous human testing with the target beneficiaries. Alternatively, the groups developing the new sonification methods and resources are largely working without communicating with each other and, crucially, there is a stark lack of peer-reviewed literature on the topic. To remedy this situation, we have conducted a survey aimed at collecting information about projects that sonify scientific data. We are currently analyzing the answers to identify common practices, start working toward sonification standards, and demonstrate the value of sonification for both BVI and sighted users. During the talk I will discuss the existing efforts to turn astronomical data into sound, including how to properly document them and advertise them among researchers and the general public. Questions that will be discussed are: 1. What was the purpose (e.g., research, outreach, ...)? 2. Did the way the datasets were sonified depend on the purpose itself? 3. How was it tested, with what audiences and what were the results of this testing? 4. How was it disseminated and how effective was this?
Oral presentation

Montserrat Villar Martin
C. Briones, D. Barrado Navascues, J.A. Caballero, S. Caballero, E. Lázaro, E. Villaver

Cultura con C de Cosmos (Culture with C for Cosmos)

Cultura con C de Cosmos (Culture with C for Cosmos) is an interdisciplinary project created and organized by a team of scientists at the Center of Astrobiology in Spain. The goal is to do Astronomy and Astrobiology outreach through art, music, literature, poetry... supported on the essence, experience and initiatives of numerous cultural entities based in Madrid. In parallel, to disseminate knowledge about their legacy and collections from the perspective of science observations. Two editions were celebrated: October 2018 to March 2019 and November 2019. The outcome in number was this: 73 activities (conferences, concerts, theater, exhibits...), more than 100 collaborators (science researchers and communicators, artists, musicians, photographer, historians...), 40 entities involved (museums, universities, libraries, etc), 31 venues; “11,000 visitors to the activities. I will present the context, goals, challenges, outcome and the future of Cultura con C de Cosmos.

Oral presentation

Allyson Bieryla

Soley Oskay

Hyman, Beatriz

Iribarren

LightSound2020 Experience: The Great Total Solar Eclipse in Chile and Argentina

The great South American eclipse of December 14th, 2020 was an opportunity to witness the impact and the effectiveness of cooperative work performed by citizens in a multimodal approach to these kind of events, which until now were only visual phenomena. LightSound is a sonification device developed at Harvard University, originally for the 2017 North American solar eclipse with sound. The device was constructed and distributed across Chile and Argentina for the Total Solar Eclipse in 2019 funded through an IAU100 Special Projects grant. Building from the success of the 2019 events, LightSound devices were distributed along the 2020 path to allow full coverage of the event, and in the framework of the pandemic, local teachers along the totality path received a previous training course to use the sensors and were the “scientists” in charge of the observation of the eclipse, including the collection and sonification of the data during the 3 hours of the event. More that a hundred thousand people along the totality path and beyond participated in this new approach to the eclipses: the use of sound to “observe” or “detect” the Sun coverage by the Moon. In this contribution, we share the experience of the new “citizen scientists”, the impact from the teachers and their students, and the results from the LightSound along the path of the eclipse in South America. We will emphasize our future plans for upcoming solar eclipses, including the open source resources available to all users and future workshops. We will also highlight the development and use of Orchestar, a sonification tool that outputs sound based on color, or the wavelength, of light.

Oral presentation

Amirul Kamarulzaman

Muhammad Hafez Ahmat Murta

Most Viral Astronomy Hoax News in Malaysia and Strategy to Convey the Truth

The world is currently facing the Covid-19 pandemic where the coronavirus has infected around 119 million lives and caused more than 2.6 million deaths. Despite this deadly virus, there are few other types of “virus” that are regularly being spread among the public which is fake news and anti-scientific actions. It is a huge challenge to cope with these types of “virus” as they are being widely spread through the social media without having to come into physical contact. The spread of hoax news and false information about astronomy news leads to a bad impact on the general public especially in Malaysia. With low knowledge and lack of awareness about true astronomy news among the public, they tend to believe all the fake news. Moreover, things become much worse if they wrongly interpret the fake news related to religious underline which keep on happening in Malaysia. This happens in order to disrupt the harmony and peace of the public life. Therefore, Apadilangit; Universe Awareness Malaysia took the responsibility to create more awareness about astronomy news and provide a one stop centre platform for the public to seek for the truth behind any fake news that they heard of. This effort is aimed to educate them to find the correct source of reference when seeking for the truth about astronomy news and they should not believe any non-sciences websites and tabloids.

Oral presentation

Matthew D. Lamb

n/a

The Ancient Aliens Effect: Exploring Astronomy Communication and the ‘Space’ Race of the Attention Economy

Pop culture’s effect on our attention is profound. The attention economy has ushered in a new ‘space’ race; a competition to occupy the spaces of our attention, devices, and hopefully our habits. Thus, the gaze, or the embodied form of perception, is a fiercely contested personal, economic, and scientific space. My research directly engages popular culture and the myriad environments in which astronomy communication messages are produced and consumed. Astronomy Communication must compete in and amongst the various media constituting the attention economy. Popular media like Ancient Aliens serve as useful metrics for understanding public engagement and how this impacts the public understanding of astronomy. These frameworks effectively situate astronomy communication messages for more complex understandings. This will lead to better strategies for meeting the challenges we face in communicating astronomy to the wider public, educational systems, and policy makers.

Oral presentation

Hossein Khalilzadeh

Saeed Jafari, Sanaz Mohammadi, Shirin Shaterzadeh, Mina Ghodsi, Maryam Heydari

Under Iran Sky Programme: an Open Astronomy School

Under Iran Sky is an IAU-OAD funded* programme which has been launched with the goal of creating an open online astronomy education school to develop a sense of universal citizenship that helps educate students and young people during COVID-19 time in Iran. The programme consists of 3 small projects and has implemented more than 100 educational courses, webinars and online observing programmes so far along with producing astroEDU Masterclass, in partnership with 30 astronomical associations and scientific groups. This platform is also developing supplementary practise exercises and materials in Farsi for educators as well as teachers who are not familiar with the e-learning environment and digital skills and teaching. Under Iran Sky have been developed project goals that cover a range of domains of learning: motivation, scientific skills, knowledge, and intercultural attitudes. During the pandemic, many Iranian students and educators have been deprived of education in underprivileged areas due to lack of internet speed, web accessibility and digital devices. For this reason, we have been launching a campaign by donating course participants and people to provide practical activities as well as materials and distribute educational kits to students in disadvantaged areas. Moreover, the programme constituted “Iran Astronomers Network” by inviting amateur astronomers, science communicators and astronomy teachers from different towns and cultural backgrounds to increase the level of engagements in the local communities. These activities are helping this initiative to engage educators and students through active learning in a truly national cooperation Under Iran Sky. This article presents the development, from concept to implementation and its impact, and a preliminary analysis of the small projects with challenges have been facing in inclusive learning and equitable education, along with lessons learnt and best practices from the campaign and its social media plan as well.* As part of the Extraordinary call for COVID-19.
### Oral presentation

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<th>Tania Johnston</th>
<th>Wolfgang Vieser, Alvaro Almeida, Tobias Beuchert, Nelma Silva, Oana Sandu</th>
<th>The ESO Supernova through the pandemic</th>
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<td>The pandemic has had a significant impact on astronomy communication with the public, not least on the operation of astronomy visitor attractions, such as public observatories, planetariums and visitor centres. For a large part of 2020 and still now in 2021, such visitor attractions have had to close their doors to the public and consider different methods for engaging their audiences. This saw an increase in digital engagement, but teams often lacked the necessary skills in this area. And, whilst it is possible to engage larger audiences through online activities, it can be difficult to build up an online following. Also, it is crucially important not to lose sight of those potential participants excluded. Even when facilities could again offer activities on-site, programmes had to be adapted due to the necessary health and safety measures. Physical distancing makes some activities completely impossible and hands-on activities become logistically more complex due to the required additional cleaning. The landscape of communicating astronomy in a visitor attraction has been significantly altered but it is not all doom and gloom. The pandemic has provided opportunities to step back and consider how we engage different audiences, to be creative in finding ways of interacting with people from a distance and for staff to learn new skills. There have been many lessons learned and the future could quite possibly be one of hybrid events, which could engage broader audiences overall. The ESO Supernova Planetarium &amp; Visitor Centre has not been immune to these challenging circumstances. In this session, Tania Johnston, Head of the ESO Supernova, will talk openly and frankly about the realities of operating a visitor centre during a pandemic.</td>
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### Oral presentation

| Jessada Keeratibharat | NARIT Astronomy Camps is a rich program of astronomy and leisure activities which was established for Thai high school students from all over Thailand in order to inspire and expand knowledge about astronomy among students as well as to build an astronomical community among the students. NARIT Astronomy camps are divided into 2 different programs, which is NARIT Youth Camp (NYC) and NARIT Astronomical Society (NAS), each program takes 4 days during winter at Inthanon mountain, Thailand. Firstly, NYC focuses on inspiring the students, sharing cultures, and having a better understanding about careers in Astronomy through astronomical activities such as stargazing, learning how to use telescopes, and also visiting Thai National Observatory. Moreover, participants will be given a mission and will be challenged constantly to engage in individual and group interactions. After the camp is finished, NYC participants will have an opportunity to register to be staff assistants for NYC camp next year in order to keep the connection and to build the student network. Secondly, NAS is designed for students who are interested in arranging their own Astronomy club in their schools which theoretical and practical knowledge are integrated. NAS focuses on learning how to manage an astronomy club as well as their roles to complement the club. Participants will be offered a great opportunity to join exciting activities at a higher level such as stargazing planning, astrophotography, making astronomical materials, and astronomy projects. All these activities will surely be beneficial for participants to learn and handle their own duty in astronomy clubs in school. NARIT Astronomy camps have been conducted successfully for over 10 years. The successful results can be seen from a group of ex-participants from the NYC program has re-registered as staff for the next year program to learn how to plan and to manage their own astronomy camps as many active leading camp organizers do. |

### Oral presentation

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<th>Ka Chun Yu</th>
<th>Storytelling in Astronomy</th>
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<td>Storytelling is a fundamental way in which humans have transmitted cultural knowledge, and we appear to be wired to be receptive to this narrative form. Despite the fact that astronomical knowledge was passed down via storytelling in the past, it is little practiced in astronomy education today. And although astronomy is a popular topic with the public, the usual methods for disseminating information are often not effective for retention, because they involve listing one fact after fact another, which is not memorable to a listener. Therefore, I will present an alternative schema where the tools of narrative storytelling is used to create more compelling content. This can be done using an And-But-Therefore framework which comes from the entertainment world, but which can be adopted to tell astronomy stories. I will end with examples of introductory astronomy topics that are recast into a story format.</td>
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### Oral presentation

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<tr>
<th>Shaaron Leverment, Wendy Sadler</th>
<th>Placing participation, equity and inclusion at the heart of engagement</th>
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<td>We have known for some time that our efforts in science education and engagement are biased. Unconsciously or consciously, we have been excluding sections of society. The gender, socio-economic and ethnic inequalities in STEM participation are deep seated. They are not simply the product of individual preferences but are profoundly influenced by social norms and processes*. Astronomy and space science communicators and engagement professionals have a crucial role to play in challenging this continuing echo-chamber and broadening the diversity of our science and our wider science engagement. These researchers, practitioners, organisations and networks are working to reframe the obvious question of who is engaged, to first consider who we are excluding “Who is not in the room?” This session explores the approach, findings and shares the evidence and tools being utilised across two programmes of astronomy and space science engagement: ‘Explore Your Universe’ (across the UK science centre network), and “Our Space Our Future” (a pan-European project working with outreach organisations). Both programmes promote a vision of a society where a far more diverse range of people, feel they can contribute and engage with space sciences and feel at home in our astronomy spaces. Taking an evidence-informed methodology and building from sector-wide best practice, we will provide a snapshot of the approach, techniques and the impact we are achieving, alongside the challenges we face. We will share examples of practices that underline the role of science communicators in inspiring greater trust and how, by leveraging ownership, identity and an active voice, we can not only welcome more diverse participants, but encourage a true sense of belonging and identity with the space sciences. This session aims to share the ideas, knowledge, practice and resources from these current European programmes as together we work towards a vision where astronomy and space science sit at the heart of society for all. *<a href="https://bit.ly/2Uv3QfE">https://bit.ly/2Uv3QfE</a></td>
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Oral presentation

Daria Dall’Olio and Paolo Morini

"Il cielo sopra di noi": spacing out from the covid lockdown

In this talk I will present our project "Il cielo sopra di noi" ("The sky above us"), that has been awarded the "Lara Albanese" 2021 prize, as the best outreach and educational project of the year, by the Italian Planetaria Society, PlanIT. From the spring of 2020, the COVID-19 pandemic hit Italy severely, with the country starting an extreme lockdown and suspending any on-site school activity. Similarly, all lectures and workshops that would normally be held in planetaria were also shut down. Students and instructors faced hard times when teaching had to be done on-line. It is well-known that forced isolation, the impossibility of going out, the lack of physical contact with other members of the community, have a strong negative impact on the students’ mental and body health. Having to stay at home for months, the students were at danger of halting the normal process of learning. Isolation led to discouragement and triggered a number of cases of depression. The ARAR amateur astronomers association and the civic Planetarium of Ravenna reacted quickly, gathering “good energies” from their members and networks to help the town and the schools fill the vacuum of activities and social contacts. Our response started by making all popular science seminars freely available on-line, but the breakthrough came with our project "Il cielo sopra di noi" ("The sky above us"), aimed to assist schools in coping with the difficulties that arose during the lockdown. We involved students and teachers in a series of activities to help them mitigate the effect of isolation and not to lose the sense of community. The students joined meetings and seminars with professional researchers; they interviewed professional and amateur astronomers live on the school radio; they gave accounts of such activities on the school newspaper. Astronomy lectures and guided observations of the sky were held on-line, using windows and balconies as astronomical observatories; while connected via social networks, the students hunted for StarLink satellites and observed the Moon, measuring its position and apparent size. Some students wrote poems about astronomy, and discussed the astronomical references in literary works, such as the Divine Comedy. This project showed that astronomy is a powerful force that can create social bonds, can offer shared moments and positive memories even in such a dramatic time of social distancing. Moved by a common interest in astronomy, and using social networks as tools, students were able to work in groups even though they were isolated at home. The outcome was a passionate and active participation by the students. The teachers recorded a positive after-effect also in other school activities, and agreed that the project had positively impacted on the learning process, by stimulating important aspects such as higher-order thinking, metacognition and curiosity. Astronomical activities have definitely helped in maintaining the sense of being a group and the collaboration among students, and contributed to keeping a positive mood, averting as much as possible the feelings of depression and isolation that have accompanied the Italian population since the beginning of the pandemic.

Oral presentation

Chris Harrison Barnabas Barna, Gabriela Calistro Rivera, Chiara Circoltea, Miranda Jarvis, Tereza Jerabkova, Rostia Kototanekova, Kateryna Krachenko, Lucy Moocra, Dinka Milakovic

IAU100: Ambassadors for Astronomy

Our IAU100 Special Project "Ambassadors for Astronomy" raises awareness of astronomical discoveries and developments created by international collaborations throughout the last century. The project targeted five primary countries: Croatia, Hungary, Slovakia, Bulgaria and Ukraine. For each of these nations we have an "Astronomy Ambassador". These are early-career astronomers (students and postdoctoral researchers) who are currently, or were previously, based at the European Southern Observatory and are nationals and/or speak the native languages of these countries. They are ideal role models for inspiring the next generation of astronomers and promoting international collaboration. Due to the careful use of our resources, we were additionally able to carry out activities in Ethiopia with four Astronomy Ambassadors in tandem with the IAU Scientific Meeting 356. Our Ambassadors visited education centres and donated interactive equipment for three inquiry-based workshops in each country, including activities that are accessible to people who are blind and vision impaired. One example of success is that the centres to provide ongoing support and to ensure sustainability for the project.

Oral presentation

Chris Impey

Addressing the Pandemic of Science Misinformation Online with Machine Learning

We are living through a time of unprecedented assault on facts. While most of the ferment of disinformation centers on politics and culture, the collateral damage to science is substantial. Civic discourse is suffering from “truth decay,” characterized by 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. "A lie travels halfway through the world while the truth is putting on its shoes." This aphorism of writer Jonathan Swift predates the Internet by centuries, but it is particularly relevant during the age of social media. This talk will describe a novel artificial intelligence system designed to detect science misinformation online. Neural networks are trained with curated sets of non-technical scientific articles, comprised of equal numbers of legitimate and misleading or "fake" articles. Initial testsbeds were on climate change and evolution, where the neural networks achieved 90% accuracy in classifying articles as real or fake. This testbed is being expanded to a wide range of topics, including some of direct interest to astronomers, such as astrology and UFOs. After the training phase, the machine learning will be applied to large samples (hundreds of thousands of articles) drawn from the CommonCrawl of the entire world wide web. This data will be used to diagnose the prevalence of science misinformation online. The technology will then be deployed in two tools aimed at helping the public navigate science information online. The first is a web browser extension that will judge the veracity of a science source in real time, give a color-coded Bayesian probability that the article is legitimate, and if it is not, refer 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 will allow the crowdsourcing of the neural network training using citizen scientists. The goal is a major new tool in the fight against scientific misinformation.
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<th>Chris Harrison</th>
<th>Making a Planetarium Show BVI Accessible</th>
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<td>Looking up at the beautiful night sky and viewing the exquisite astronomical images from professional telescopes captures the imagination of people around the world. Furthermore, immersive astronomy shows are popular features in planetariums, utilising full-dome imagery and movies with stunning resolution. However, such wonderful experiences can be little-to-non-existent for people who are blind or visually impaired. The subject of astronomy is particularly inaccessible for visually impaired school children due to its typically visual nature and a lack of accessible curriculum-based resources. Furthermore, despite planetariums hosting high-quality surround sound systems, the audio tracks in existing shows typically play a very passive and background role. These factors can all contribute to the lack of visually impaired people working in astronomy, and in science in general. I will describe how this project aims to improve the accessibility of astronomy by working in collaboration with focus groups of visually impaired children and specialist teachers. I will present examples of audio-visual content that we are producing together. Crucially, all of the scientific content and educational messages will be understandable with the sound track alone. We are putting this together to create an open access, professionally produced, accessible planetarium show which is suitable for presenting in planetariums around the world. In combination with existing tactile models I will explain how we are also creating complementary multi-sensory educational workshops. Through this, we hope to inspire people of all sight levels with an immersive educational experience and demonstrate that astronomy and science is accessible to everyone.</td>
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<tr>
<th>Oral presentation</th>
<th>Andrew Fraknoi</th>
<th>A Free, Open-source Introductory Astronomy Textbook and an Open Education Resource Hub for Materials to go with It</th>
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<td>The non-profit OpenStax project at Rice University is a program to publish free, on-line, open-source, textbooks in every introductory field in college (and thus make college more affordable). The astronomy textbook in their series, by senior authors Andrew Fraknoi, David Morrison, and Sidney Wolff, now has over 1,100 faculty adopters, and has been used by at least 460,000 students and 70,000 independent readers. (We say “at least” because we can only count the registered users, and not everyone registers.) So far it has saved North American students more than 40 million dollars in astronomy textbook costs. The book’s development was aided by the work of almost 70 astronomers, who helped with making sure the science was accurate and pedagogy effective. The book’s Open Education Resources Hub has over 35 free ancillary materials, including new resource guides to Black Lives in Astronomy; Short Videos Organized by Astronomy Topic; Plays and Films about Astronomers; This Day in Astronomical History; Light Pollution, Dark Skies, and Satellite Swarms; A Guide to Astrophotography with your Cell Phone; and An Updated List of Astronomy Simulations. There is a new Expert TA: Astronomy Learning Management System for the book that includes a computerized bank of automatically graded multiple-choice questions, true-false questions for review, calculation problems, and graphical questions. The book URL is <a href="http://openstax.org/details/astronomy">http://openstax.org/details/astronomy</a> (and you can get to the OER Hub from the Instructor Resources page.) So far the materials are all in English, but we are open to translations into other languages. We invite anyone teaching Astro 101 to examine our materials and join our community.</td>
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<th>Oral presentation</th>
<th>Timothy Spuck Villagran</th>
<th>Growing the Astronomy in Chile Educator Ambassadors Program (ACEAP)</th>
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<td>To date, the U.S. government has invested more than $1.5 billion dollars in astronomy infrastructure in Chile, and tens of millions of dollars more each year for operations. An informed citizenry is important to the success of any national endeavor, including those focusing on the advancement of astronomy. Thanks to support from the U.S. National Science Foundation (NSF), ACEAP has developed a network of astronomy education and outreach professionals with a deep understanding of NSF-supported facilities in Chile, and enhanced STEM communication skills needed to share this knowledge with a diverse public. The Program brings amateur astronomers, planetarium personnel, and K-16 formal and informal astronomy educators to U.S. astronomy facilities in Chile. While at these facilities, ACEAP ambassadors receive extensive training on the instruments, the science, data products, and communicating STEM concepts. When they return home, the ambassadors share their experiences and observatory resources with schools and community groups throughout their local region. ACEAP is a collaboration between Associated Universities Inc. (AUI) and Association of Universities for Research in Astronomy (AURA), and the observatories they manage in Chile, including CTIO and Gemini which are now part of the new NSF’s National Optical-Infrared Astronomy Research Laboratory (NSF’s NOIRLab), and the National Radio Astronomy Observatory and ALMA, and is supported by the National Science Foundation (NSF 1439408, NSF 1723697, and NSF 2034209). Visit <a href="https://astroambassadors.com/">https://astroambassadors.com/</a> .</td>
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<th>Oral presentation</th>
<th>Conti Livia</th>
<th>On behalf of the Virgo Collaboration for the European Gravitational Observatory ENGAGING DIVERSE AUDIENCES WORLDWIDE WITH VIRGO AND GRAVITATIONAL WAVES</th>
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<td>The recent discoveries of Gravitational Wave (GW) sources allow scientists to communicate the excitement of the emerging field of GW science and have the potential to be great subjects for engaging and educating the public on astrophysics. The EGO-Virgo Collaboration is active in many fronts to communicate both the fascinating complexity of the Advanced Virgo detector and of its partners Advanced LIGO and KAGRA, and the scientific results of this worldwide network of GW detectors. This talk will review the main tools used in this effort, including some specifically developed to cope for the pandemic and/or to be fully accessible: from online and live remote visits and virtual tours to the site at EGO, to webinars, round tables and online events, to social media and visualization material also in collaboration with artists, sonifications, DIY activities and lectures for home/classes, educational material translated in many languages. We will also describe the target audiences we have identified and show how the diversity of our collaborations is an asset to reach them out.</td>
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<td>Oral Presentation</td>
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| Marcelo de Oliveira Souza (UENF and CALC) and Samara da Silva Morett de Azevedo (C.E. Flamengo and UFSCAR) and Jongsung Lee and CIEP Lenine Cortes Falante
| oral presentation | Presentation Oral | App to build an Analemmatic Sundial | In a very distant past, people began to notice that there was a variation in the size and direction of an object's shadow during the day. Following and analyzing these variations it was possible to build the first instrument to determine the hours during the day: the sundial. The main idea of sundials is to associate the variation of the shadow of an object, which is called a Gnomon, with the hours of the day. Today there are a large number of sundial models. One model stands out because it uses people as the Gnomon. This sundial with human interaction is called the Analemmatic Sundial. This model of sundial has an ellipse-shaped hour scale and in the center of the ellipse another vertical scale with the months of the year. In the Analemmatic Sundial, the Gnomon (the object that will cast its shadow to mark the time) is any person who will position himself on the scale that is located in the center of the ellipse. Few years ago we developed a software with basic information about the Analemmatic Sundial and that provides the necessary data for anyone to build it. With the new technological resources available we have developed an app to be used in any smartphone with Android system and which has the same functionality as the software. Using the software it was possible to build Analemmatic Sundials in schools. A master's thesis was produced about this experience. The app RSA (acronym of Analemmatic Sundial in Portuguese) is available in the link: https://www.mediafire.com/file/14v75ikuq3gld/RSA.apk/file |
| Sérgio Pereira, Ana Alves, João Retré | oral presentation | An astronomy research show is touring remote locations | Most research institutions and science communication initiatives in Portugal are based in the main urban areas. People in smaller locations away from the large cities have less chances to learn about current Portuguese research in science and technology. They also have less or no direct contact with researchers, who could inspire young people in these areas to pursue careers in science. However, they constitute a significant number of the country's population and may influence governance regarding the investment and education in science and technology. In addition, teenagers and young people in these areas may later pursue higher education courses and take on opportunities to choose careers in STEM. The Instituto de Astrofísica e Ciências do Espaço designed a national tour in which, on a Saturday evening, a group of eight to nine researchers visit a city or town distant from metropolitan areas. Following the "ignite" format and branded Ignite Astrow Tour, the researchers give quick and focused five-minute talks, presenting a wide range of research topics in a lively and fast-paced show. Working closely with the municipality, schools, teachers and libraries, the events are promoted within the local cultural scene and hosted in cultural venues and even historic buildings. Since January 2016 and until the end of 2019, 2500 people attended 19 Ignite Astrow events in continental Portugal towns and small cities, and in the Autonomous Region of the Azores archipelago. One same event may include topics like "hunting" exoplanets, "dust cleaning" in galaxies, the "puberty" of stars, and telescopes' teamwork. A number of 52 researchers (nearly half of the institute's), including PhD students, participated so far. These are also regular opportunities for them to practice and improve focused and enlightening talks. Support has been given by the institute's Science Communication group by curating the presentation slides and offering feedback on the video recordings of their performances. Researchers also enjoy the time spent with colleagues from other scientific fields in an informal environment. |
| David Tovar Barreto, Maria Angélica Leal, Santiago Páez | oral presentation | Astrobiology Virtual Festival Cota 2020. Novel strategies for astronomy, biology, and geology outreach in Cundinamarca (Colombia). | At the end of 2020, the Jose Max Leon School (Cota) and the Bachelor of Natural Sciences of the University of La Sabana organized the first Astrobiology Festival in Colombia. Due to the global pandemic, this event was held virtually, which allowed broad participation of the general public, not only from the municipality of Cota but from other regions of Colombia and Latin America. This event consolidates institutional collaborations with other local universities and scientific institutions and allows evaluation of different pedagogical strategies to identify differences between astrobiology and other pseudosciences. |
| Breezy Ocaña Flaquer | oral presentation | Down to Earth Astronomy in the Dominican Republic | Most people in times of COVID have been able to participate in many activities online. It has opened a wonderful door that has allowed people to attend conferences, meetings, teacher trainings that otherwise would not have been possible. This applies also to people with limited access to electronics, and some internet connections. However, what happens when the people are from a village, with no access to electronics, or internet? They are isolated, and COVID has made this worse. For years we have been trying to collaborate with people that have no access to resources. There are kids in the villages that, if left alone, might find it challenging to find an interest in something different than what they have already being exposed to. Outreach and education in astronomy is not only about training the next generations of astronomers, it is also about opening a new door for ways in which people can learn about everyday circumstances. Through astronomy, for example, we can learn mathematics which are essential for anything we do in life. Moreover, it is about understanding we are all human beings, part of shared, closed and interdependent systems of our planet. We share our lives in some ways with the entire planet, and we need to understand why taking global care of our planet is of extreme importance. In conclusion, the need is dire, the opportunity ample, and we can -as a team- creatively find ways to work through the inconveniences. We, as teachers, can adapt to the needs of our learners. If we have a goal that we believe in, we will always find a way. We are all together in this planet, united by the circumstances, and when we collaborate for a cause with our minds and our hearts, we succeed. We are taking astronomy, as a tool for learning many other important subjects to remote villages, with no access to electronics or computer and in times of COVID. |
Saeed Jafari

Oral presentation

Mr. Thressapo Siriboon
Mr. Sirawut Ploydang
Developing a passion for astronomy with Amazing Stargazing Experience

National Astronomical Research Institute of Thailand (NARIT) aim to provide information and offer public outreach. We have various activities to promote astronomy learning for Thai people including “NARIT Public Night” at Princess Sirindhorn Astro Park Observatory and TNO Open House. The “NARIT public night” event is to give an opportunity for people to observe the night sky through different kinds of telescope such as a 0.7 meters aperture reflecting telescope, a 14 inches aperture catadioptric telescope, a TOA-150 refractor telescope and binoculars telescope. A lot of sky objects are shown: moon, stars, planets, star clusters, nebulae and galaxies. Moreover Visitors will get a knowledge of astronomy by NARIT’s staff. We explains the basic techniques for observing the night sky: how to find north with constellations, how to identify the constellations and how to measure distance in the night sky. This event is free and do not need to make any advance reservations. The event is held on every Saturday’s night from November to May. Even on the cloudy nights, the activity would not be cancelled; visitors can see and learn about the telescope, star chart applications, and Q&A about astronomical observation. Besides, we have a special event called “TNO Open House (Thai National Observatory Open House).” This activity, visitors will have a chance to visit the highest point of Thailand (Doi Inthanon Mountain; 2,565 m above the sea level) which is the best place to see the night sky. They will observe celestial objects through the largest telescope (2.4 m in diameter) in Southeast Asia. This telescope is big enough to see the color of deep sky objects. The TNO Open House puts twice a year, in the weekend of January and February. Other than above activities, we also encouraged people to participate in astronomical phenomena; for example, partial solar eclipse in 2019. Participants were lectured by our guest speaker. Moreover, they were able to make a solar viewer by themselves to safely observe the sun through a solar filter. To see the phenomenon by their own eyes, most of the visitors were having fun and learning something new. These are some of the activities that we provide to the public.

Oral presentation

Carlos Augusto Molina
David toro,
David Acosta,
Alexander Gonzalez

Quynza Mission: exploring the moon through the window

During the 2020 mobility restrictions due the Covid-19 pandemic, Planetarium of Bogotá closed their doors as every Planetarium around the world. After six months of total virtual activity we proposed an itinerant experience named "Misión Quynza, returning to the moon". With a big portable led screen we visited close to 20 communities around the city with an interactive live show using our social media and the people cellphones as a communication tool.

Oral presentation

Nahiley Flores-Fajardo

“The Grandpas and the Astronomy” a wonderful experience that will last and grow. -IAU100 Special Project-

Associated with two of the main objectives of the IAU100, promote an access to generalized astronomical knowledge and to support and improve an Inclusive, egalitarian and diverse astronomy community, “The Grandpas and The Astronomy” was one of the 22 Special Projects selected to be supported by the IAU100. On one hand, elder is a population group little attended by the Science outreach programs, since, in general, it is considered that this has much greater impact if done at an early age. On the other hand, particularly in Mexico, the elderly people are a population group that is not well attended and frequently suffer from situations of neglect and abuse, perhaps the part of the society more forgotten and littler valued, nevertheless a very important part since they are the main transmitters of values and knowledge and traditions of a nation. Thru experiences of sky observations, handcrafts, games and chats, a small group of volunteer’s carried company knowledge, culture and fun to the elderly during the end of 2019 and the beginning of 2020. The approach to the institutions, retirement houses, third age clubs, etc., was the main challenge to be solved and now a days still the greatest defiance. Within the older adult population, activities with those who, either due to illness, abandonment or age itself, have advanced mental deterioration, are much more complex, requiring personalized attention, with characteristics of times, sizes, colors and completely different language. Unfortunately, as another millions of things, the SARS-COV-2 pandemic stopped the visiting of this places, Mexico City is the most affected city in the country and the third age people one of the most vulnerable population, and now, “The Grandpas and the Astronomy” is looking for alternatives to continue with the attention of the elderly.

Oral presentation

Saran Poshychinda

Public engagement through the education and outreach activities conducted by the National Astronomical Research Institute of Thailand and its impact

National Astronomical Research Institute of Thailand (NARIT) is a research institute but has more than 50 staff working on public outreach spread out in different observatories throughout the countries. In this talk, the speaker will give an overview of the public outreach activates by NARIT. NARIT’s facebook page has more than 500,000 followers, comparable to many institutions, and its engagement rate is constantly above 3%, which is the threshold for a good social media engagement rate, and in some news the engagement rate rise to 8%. PR value is a term used by PR companies for business, NARIT has very high PR value over the years. The talk will also include a case study using the “phosphine on Venus” showing its performance compare to other institutions. The successful stories of NARIT would be inspirational for other developing countries to develop their national wide astronomy program.

Oral presentation

Saeed Jafari
Mehrsa Latani,
Amirreza Kamkar
Lessons Learnt of Planning and Designing the IAU 100 Heritage of the Sky Special Project

The sky is our common and universal heritage, and is an integral part of the surrounding environment perceived by humankind. This heritage is important for the recognition and safeguarding of cultural properties and of cultural or natural landscapes that transpose the relationship between people and the sky.”Over the Plateau of Iran” Photo Contest was a highlight of the “Heritage of the Sky” project within the framework of the IAU100. The contest was open to anyone of any age, from any natural, cultural, and Historical astronomy heritage locations in Iran, and to both professional and amateur photographers anywhere in the world. Participants were required to take photos of astronomical and historical monuments or nightscape photography from dark sky national parks and to provide a detailed explanation — storytelling of the site — alongside each photo. This photo contest received a total of 177 qualified works. Most of the images were from diverse geographical areas, where some of the photographers spent days planning their trips. The presented works included sites that date back to ancient Iranian civilisation and that are symbols of its history and culture. This presentation will present the way we can communicate the night sky with the public and what is the best tips and strategies to attract and engage diverse audiences by disseminating stores behind nightscape photography from historical, cultural and geographic heritage sites on online media channels. Moreover, we will share a summary of the lectures given on archaeoastronomy and cultural astronomy, light pollution and preservation and protection dark night skies in places such as cultural landscapes at the award ceremony of the contest.
Oral presentation

Vivian White

Bringing Big Astronomy to Your Community: People, Places, Discoveries

The Big Astronomy planetarium show and supporting media and resources are exploring the ecosystem of science learning within communities around topics such as 1) the many different people and jobs necessary for big science, 2) how the clear dark skies and talented people in Chile combine to create an ideal location for the world’s largest observatories, and 3) how cultural astronomy informs and helps our current understanding of the universe. The goals of Big Astronomy include expanding the definition of those “doing science” to include all the people who work together at large observatories to answer astronomy’s biggest questions, not just professional astronomers. The award-winning planetarium show highlights the diverse people and jobs required to run Chilean observatories and make cutting-edge discoveries. The model of Big Astronomy encourages participation after the planetarium show with online and in-person activities to build on the concepts explored in the dome production. The planetarium show acts as a catalyst for interest by showing diverse people doing real science and including other aspects of their identities. Live virtual events show people engaging in science alongside their other identities to support learners by seeing themselves represented. Educational activities provide ways for people to ask questions, to reflect on understanding, and to engage with a specific topic in an accessible way. By offering multiple entry points through the different resources, we also provide people the means that best fit into their lives, interests, and identities, making it easier to choose to learn more. The research project is then built to see how this works in practice. The goal is to improve our understanding of engaging people well beyond a visit to the planetarium but also to explore how we may use those components to encourage people to visit their local planetarium. The research project has also had to pivot in light of the COVID-19 pandemic. We are now trying to understand how people navigate between the resources and virtual versions of the show as well as understand how people engage with online 360° streamed versions of the planetarium show and if they feel they are as effective as those in the physical space of a planetarium. Together, these resources support science learning and identity in students and families and allow access at many points from a science center, a planetarium, in their own home virtually, and with hands-on activities. Research will show how the combination of factors may increase visitors’ identity as scientists and inspire them to continue their path of engagement with additional astronomy content.

Oral presentation

Santiago Vargas Domínguez

Angélica M. Olaya

Augmented reality as a resource to improve the reading experience while communicating astronomy

Among the resources to communicate astronomy, books have always been a major source of interest. New technologies incorporated to books can boost the reading experience making it more attractive, specially to children and young readers. This work presents a publishing effort from the Faculty of Sciences at the National University of Colombia, that incorporates augmented reality in a children’s book about the Sun. “Mi primer libro del Sol” (My first book of the Sun) was presented at the Bogota International Book Fair, one of the most renowned in the country and around the world, becoming the best-selling book for academic publishers. The book has been used in multiple scenarios to communicate the current knowledge about our star, highlighting the importance of not looking at the Sun unless we have a safe way to do so.

Oral presentation

Thembelo Mantungwa

Prof. LJ Theo

Relationship-building between communities and astronomical observatories in South Africa

Astronomical Observatories mainly focus on scientific research to understand the Universe. While some also make an effort to inform the public about their work as a form of exchange (tax contribution in return for proximity to astronomy). On occasion, the outreach activities are audience-specific, for instance, school-going children, as well as university students then some public programmes, informed by what Observatories deem shareable. While this study is not yet finished aims to explore relational-management practices that exist between the South African Astronomical Observatory (SAAO) and the Sutherland community. Using the public relations management process, we seek to understand perceptions of the Sutherland community about the SAAO.

Oral presentation

Dr. Giulia Chaniotakis

Mr. Emmanouil Sofoklis

Bringing large Research Infrastructures in Astronomy to the public: best practices from the European project FRONTIERS on science outreach and education during the pandemic and beyond.

The Sars-CoV2 pandemic has suddenly reshaped the landscape of formal and informal education worldwide. At first, direct contacts between the general public, including teachers and students, and Research Infrastructures (RI) and institutions organising school visits, face-to-face training workshops, physics masterclasses as well as open events for the general public were abruptly put on hold. However, the shift in lifestyle and general perception both of scientists and the general public towards online activities unexpectedly opened up new possibilities and quickly brought up creative solutions adapted to the new situation but extendable beyond the limits of the pandemic. In this talk, we will address the issue of bringing RIs, in astronomy and beyond, closer to the public and fully exploit their potential to be global catalysts for scientific literacy, taking advantage of the restrictions imposed by the present pandemic to extend their reach and impact from local to global by means of online training events and Virtual Visits as well as a range of connected activities. In particular, we will present the methodology developed by the FRONTIERS Project (www.frontiers-project.eu), an EU funded project aiming to bring Nobel prize winning physics to school classrooms to motivate students towards science and to foster critical thinking in new generations, strengthening their resilience against pseudoscience and stimulating them to be active members of a knowledge-based society. We will report on the concrete actions implemented as part of the FRONTIERS approach that is constituted by: - Fully-online international training events. A summer and winter school took place during the last year with more than 200 participants with a broad geographical coverage ranging from Nepal to Chile. - A series of short-term online teacher-training workshops for teachers in the five project partner countries. The workshops engaged more than 500 teachers so far. - Design and implementation of more than 20 online activities on cutting-edge topics in astronomy and physics ready for implementation in the classroom. - Creation and expert-support by scientists and experts in education and pedagogy of a worldwide community interested in astronomy and astrophysics. In this context, Virtual Visits are co-organised with large RIs to attract and motivate the audience, providing a unique and engaging experience. Visits were organised with the ESO-Virgo gravitational wave observatory in Italy; the LHC experiments at CERN; and the first-ever virtual visit to the Pierre Auger Observatory in Argentina. These visits engaged more than 5000 teachers, students, and citizens overall. We will present preliminary results from these ongoing online activities, indicating that the FRONTIERS approach has increased teachers’ self-efficacy in teaching Nobel Prize Physics by a factor of 15%, a result that is on par with face-to-face workshops carried out by the project team prior to the pandemic.
**Oral presentation**  
Basilio Solís-Castillo  

**Conversations about the sky in Atacama: Scientific knowledge and local traditions**  
Communicating astronomy to broader audiences is always a challenging task because it must contain the scientific accuracy but has to be explained in simple words, available to everyone. An extra difficulty arises when we talk about indigenous communities. Nowadays, Atacama Desert is home to a number of international observatories that have used their unique skies to make several scientific discoveries pushing forward our understanding of the Universe. However, astronomy is not a new thing in Atacama. The ancient Atacameños, as well as other cultures in the Andean region, looked to the sky and embodied their beliefs and traditions using the dark regions of the Milky Way, creating the so-called dark constellations. This ancestral heritage has been preserved by indigenous communities until today, but in many cases completely ignored. In the present talk, I will share the experience of participating on a project that invited scientists from different areas to talk together with representatives of local communities in the Atacama region. Here, we motivated conversations about local culture, traditions and language and their connection with the sky. Finally, our results reveal that local communities still have traditions and stories that have survived the colonization process for centuries and proved a tighter link with the sky in the past. These findings can be used to support further initiatives to engage with indigenous population and make astronomy a more inclusive science.

**Oral presentation**  
Lána Salmon  

**Engaging diverse audiences with STEM through the EIRSAT-1 CubeSat mission**  
Ireland is taking its first step as a spacefaring nation with the EIRSAT-1 CubeSat mission. Coupled with the growth in the global space sector and significant public interest in the topic, the mission presents a unique opportunity to engage with audiences across all age groups. EIRSAT-1’s extensive outreach and engagement activities have focused on one key message - the accessibility of space to all - communicated through a diverse team of students from different disciplines. The Educational Irish Research Satellite, EIRSAT-1, is being implemented primarily by graduate students at University College Dublin (UCD), in collaboration with staff, and with the support of the Education Office of the European Space Agency under the Fly Your Satellite! programme. The scientific goal of the mission is to detect cosmic gamma-ray bursts using a compact sensor. The technical goals include space qualification of technologies that have been developed in UCD. Communicating this advance in Irish space capabilities is another important goal of EIRSAT-1’s outreach activities. Beyond the technical, educational and capacity-building goals of the mission, the mission also aims to (i) inspire wider study of Science, Technology, Engineering and Maths (STEM), while highlighting the importance of multidisciplinary teams and (ii) create greater awareness of space in our everyday lives. Students building a CubeSat mission are ideally placed to communicate core space science and engineering concepts in an exciting way based on their experience. EIRSAT-1 outreach and engagement activities are focused on 4 main groups - the general public, primary and secondary level students, university students and under-represented groups in STEM. Each demographic has been targeted through different activities, including public talks, live ‘space themed’ events (e.g. ‘Baking in Space’ shows), panel discussions, Irish language initiatives, competitions, TV/Radio programmes, careers events, school workshops and Women in STEM events. Activities have been delivered online since March 2020. Cross-disciplinary collaboration with artists and poets has helped to reach wider audiences. The EIRSAT-1 team is collaborating with the Museum of Literature Ireland, the UCD School of English, Drama and Film and the Junior Cert Schools Program librarians to deliver two artistic engagement projects. The ‘Space Poetry initiative’ involved 12 secondary school students from across Ireland who co-wrote a poem with the theme of ‘Home’ through guided online workshops with UCD creative writers. This poem will be etched onto EIRSAT-1. The ‘EIRSAT-1 Space Art Challenge’ is a national student competition to create art following prompts and guided videos from five Irish artists. This paper provides an overview of some of the outreach and engagement initiatives undertaken by the EIRSAT-1 team. Future plans to reach larger audiences are presented, including educational initiatives with the amateur radio community.
How does a fundamental science like astronomy, that looks out beyond Earth’s borders, connect with the Earth-bound SDG Agenda? This question is the basis for the research and the following presentation. The hypothesis is that astronomy projects are contributing to the SDG Agenda, without being aware that they are. The research that will be conducted looks to gain insights between the astronomy projects and SDGs by identifying the use of a common language and assessing many examples of current projects. The focus will be on the target level of the Agenda in order to access a meaningful, measurable contribution. As the study of astronomy looks out to the universe, it is a study revealing the bigger ecosystem we are a part of, creating a sense of awe and trying to establish a sense of understanding amongst all. This sense of being a part of something bigger transcends the ecological vision we hold of Earth and leads humans to new ways of looking at the world around them, reaching for new discoveries and developments. This cognitive shift that can take place when looking out to the universe can encourage increased environmental awareness and fosters the taking of bigger steps to approach the complex problems concerning sustainability. As much as astronomy looks out from the planet, regarding everything outside of our sphere, humanity has reached a point where we need to look back down at ourselves from the outside. When looking back to Earth from above we can see the devastation of our own planet and the challenges ahead of us to sustain our own vulnerability. To address these problems, the United Nations launched the SDG Agenda in 2015 with the objective to produce a set of universal goals that meet the urgent environmental, social, political, and economic challenges facing our world. The SDGs are a set of 17 goals created to address global challenges such as poverty, hunger, inequalities, and environmental threats by 2030. These goals are further divided into 169 targets and 232 indicators, thus making the achievements of the goals measurable. Scientific knowledge lays the foundation for technological innovation and drives economic growth. Being a data-intensive and technology-based science, as well as deeply culturally rooted, astronomy provides many opportunities to foster development. Fundamental sciences, including astronomy, often lead to societal and economic impact after many years because they constantly push the boundaries of knowledge and technology. However, there is also a more direct, current impact. This presentation will detail the research findings and explore the capabilities that astronomy projects already contribute to the SDG targets and how they could do more. During the presentation examples linking astronomy to the SDGs will be given. The common language will be explained, and it will become evident how closely astronomy and sustainable development are linked. Proving that we are all part of a bigger system.

There is a growing body of work on equity, diversity and inclusivity within professional astronomy. Collaborations between amateur and professional astronomers (pro-am collaborations) are on the rise. But the literature on equity, diversity and inclusivity within amateur astronomy is still sparse. It is increasingly important to understand the makeup of the amateur astronomical communities, and the barriers to wider involvement. In this day and age, astronomy should belong to everyone, and everyone should feel like they belong. The demographics of astronomy societies and online astronomical communities, including adjacent communities such as citizen scientists, appears skewed towards being mostly white and male, e.g. in the Galaxy Zoo project there was an observed 82:18 male:female ratio. Anecdotal evidence for usage of astronomy forums and sites again suggests a ratio of 80:20 male:female at best. For the Rosetta Mission Amateur Observing Campaign, over 90% of observers were male. It is now established that this should not be ascribed to a lack of interest in astronomy (or science in general) in different audiences. Rather, it is driven by the subtle biases that persist in associating only white males with a science interest and the multiple ways in which these biases discourage traditionally under-represented demographics in engaging with science and engineering. Traditionally under-represented people face the challenge of not being able to build a strong science identity. Work is underway to quantify the scale of the issue of bullying and harassment in professional astronomy, e.g. the recently completed Royal Astronomical Society survey. Is astronomy unwelcoming to under-represented groups? Is the problem that the fewer under-represented people who are part of the initial pool then do not feel welcomed when they join, fuelling a vicious circle? We investigate the demographics, as well as the attitudes and experiences, of members of the amateur astronomy community in the UK, through a survey distributed through traditional institutions, online forums and groups, and social media. Data collected (especially sensitive personal data) is stored according to GDPR. All data will be anonymised. Participants can optionally provide their email address for a follow-up survey. The preliminary results will be presented in an interactive poster, and we will use the interactive, virtual nature of the meeting to stimulate a wider discussion within the community. We gratefully acknowledge the support of RAS, FAS, SPA, BAA, UKSEDS, BIS in distributing the survey.
### Oral presentation

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<th>Topic</th>
<th>Authors</th>
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<tr>
<td>&quot;Development Astro-tourism education for herders in Mongolia&quot;</td>
<td>Bayarkhuu Chinzorig, Batmunkh Bayarsaikhan</td>
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<td>Astro-tourism education for herders is important role in Mongolia using astronomical outreach activities. Human induced activities have had a significant impact Mongolia, resulting in light pollution, increased occurrences of drought, water source depletion, dust storm and affecting the well-being of local communities. To protect natural heritage area there is need to develop healthy sustainable economy such as Astrotourism. Why Mongolia is perfect place for Astro-tourism: -Mongolia have the lowest population density in the world. Small amount of population (around 3.3 million) and large amount of area (total: 1,566,000 km²) - No light pollution - Very beautiful nature and wildlife - Nomadic life style who has livestock (30% of population) - Very unique cultural and historic places - The incredible landscape in Mongolia Mongolia have constructed 21 provinces (aimag) and above reason every 21 provinces are possible potential areas for Astrotourism. Area types: Forest area Desert area Mountain area Grassland area. Our purpose is to provide talks and training course on development Astrotourism activities. The topic on Environmental protection and importance of having clear beautiful dark sky in Mongolia will be highlighted in this training. The training will provide guidance on development Astrotourism. In order to attract tourist people into their region the local herders and government policy makers need to improve their knowledge and skills. Herders will learn how to use intelligent lighting, inspiration of the night sky, and understanding of the impacts of light pollution on Environment and nature. Encourages more people to understand Astrotourism and to participate in environmental protection activities in Mongolia. Local herders have no idea how astronomical outreach can be an excellent tool for protecting the dark sky and developing Astrotourism. We will try to enlighten people to understand that Astrotourism can lead to healthy sustainable economy. The local governors and decision makers will think about protection of clear sky and manage Astrotourism development. After implementation of training course, more herders will be involved in Astrotourism and bring more tourists in their region. The following subjects will be considered. - How to run astronomical events in Mongolia - Identify beautiful astronomical events to use to attract visitors - Apply best practices for outreach, to introduce more scientific concepts to make their tours more interesting - How to use a telescope - Astrophotography activity We support development of tourism in Mongolia and other foreign countries. It helps both travelers and local people to obtain and exchange accurate information about Mongolian and all over world tourism. Tourists who are travelling to Mongolia can get wonderful experiences about Mongolian nomadic cultures, wildlife and enjoys beautiful sky with STARGAZING.</td>
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<td>Development Astro-tourism education for learners with Visual Impairment (VI)</td>
<td>Elvi Khasanah, Pramudya, Khairul Ardi, Cintha Wandira, Nicka Tantilla</td>
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<tr>
<td>Astronomy through Measurement for Learners with Visual Impairment (VI)</td>
<td>Yudhiakto, Neha Deshpande</td>
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<td>The mobility is limited during the covid-19 pandemic. The Observatorium Universitas Ahmad Dahlan (UAD) has to be closed for the visitor since March 2020. Several services have to be postponed or canceled. In this paper, we described the effort to overcome the difficulties to connect the observatory to the public. The observatory launched the virtual tour service in August 2020. The virtual tour menu is embedded in the observatory website. The visitors are able to browse into the number of rooms at the observatory. The virtual tour menu starts to get more visitors as the public getting more and more curious about the observatory. The routine online podcast program is also added to promote the observatory besides providing astronomy knowledge to the public. The virtual observations on the celestial phenomenon are performed to share the real-time moment of observation to the public. Recently, the virtual tour was launched on March 2021. The Tangerang Elementary School was the first school that requested to be the visitors. About 15 students and teachers were actively asking questions about the real-time sun observation. The tour guide also gave information about the telescopes and the sun’s characteristics. Even though the observatory is currently open only for university lecturers, staff, and students, the virtual visit is becoming a popular service to keep connecting the observatory to the public. Besides, the virtual visit is allowing students in the remote area to access the telescopes at the observatory.</td>
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<td>Top-Down Approach to Astronomy Outreach at the National Level in Thailand</td>
<td>Matipon Tangmatittham</td>
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<td>Astronomy is one of the most important gateways for general public’s appreciation in science. Before the National Astronomical Research Institute of Thailand (NARIT) was founded there had been no active astronomy outreach programs in Thailand. When NARIT was founded just eleven years ago we took it as one of our important tasks to uplift the country’s interests in astronomy and appreciation in science. As the only public organization in Thailand that engages in astronomy outreach, NARIT’s public outreach department not only engages in all forms of outreach, but also took a systematic approach in all aspects of Thailand’s astronomy outreach and promoting science awareness. Even though we have activities targeting all types of audiences, the big part of our focus falls upon training proxy outreach personnel: educators and instructors, training new amateur astronomers, astrophotographers, etc. Great emphasis is put on promoting informal astronomy education, creating networks of educators, instructors, and volunteers well-versed in astronomy outreach. Managing the outreach on the national scale comes with its own unique sets of difficulties and challenges. This talk will showcase the strategic layers involved in creating a sustainable and long-lasting interest in astronomy and science awareness for the entire country.</td>
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### Oral presentation

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<tr>
<th>Filipp Romanov</th>
<th>Free popularization of astronomy in Russia by an amateur astronomer</th>
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I started studying astronomy by self-education in the International Year of Astronomy (when I was 12 years old). On August 17, 2009 I drew attention (when I did breathing exercises on a balcony of the apartment - with bronchial asthma I have) to the beauty of the night sky over Livadiya microudistrict of the city of Nahodka (in the Far East of Russia), where I then lived. Then I did not have access to the Internet yet, so I began to study information about astronomy in books. When in 2010 I got a small telescope and Internet access, I and my mother (who helped me because I had an orthopedic disability for 10 years) took the telescope out into the street (for observing astronomical phenomena that were not visible from my balcony), then passers-by asked to look through the eyepiece of telescope and actively asked questions about astronomy, so at the end of 2011 I began my free popularization of astronomy in society: I sent information to the local newspaper what astronomical objects can be seen in the sky with a small telescope, and this letter was published there (and in February 2012 in this newspaper I became the independent author of articles - with my announcements of upcoming astronomical phenomena visible to the naked eye to people). At the same time, my astronomical photo reports began to be published on a large Russian news website of RIA Novosti - for a large number of people. In 2012 - during the transit of Venus on June 6 - I was the first of the people present at the territory of Ussuyrsky Astrophysical Observatory to photograph this rare astronomical phenomenon, about which there were no videos or channels: for example, with my interview, the news was shown on Channel One and other media. In August 2013, I moved (to study at a vocational school) to the city of Koryotov (where the topic of space is relevant), where I continued to popularize astronomy - through newspapers and TV channels of local and regional significance, on the basis of which at the end of 2015 I received a diploma (about popularization of astronomy in society) from the governor of Moscow Oblast. In 2016 (when I moved to Moscow - to continue my education), I began to make scientific discoveries of variable stars by self-education, and this fact was reported in various federal mass media, and these publications and videos increased people's interest in astronomy. In 2018, I began to conduct live streams of astronomical phenomena for a very large number of people, which, even during the COVID-19 pandemic, is an actual fact for online (without borders by regions) interest in astronomy. Now I am temporarily in my small homeland - in Yuzhno-Morskoy of Primorsky Krai, where I continue these live streams (links to these videos are also published by the mass media), for example, of meteor showers and eclipses, and I post my photos on my pages on social networks - and video reports about astronomical observations for different people.

### Oral presentation

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<th>Krzysztof Czart</th>
<th>Astronomers in Schools</th>
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Astronomers in Schools is a project run by the Polish Astronomical Society from 2019, as one of the events proposed during IAU100. Some schools invite on their own people representing various professions to meet pupils and students. Exploiting this idea we decided to offer such visits by astronomers to the large number of schools during IAU100. However an interest in the action exceeded all expectation: we have received over 1800 entries from schools all over the country and all stages of education (primary and secondary, and even some kindergartens). We were not able to visit so numerous schools during a few months, so we changed the project into long term for next few years. We would like to present our experience form running the project, as this might be useful for other countries.

### Oral presentation

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<th>Wien, Kuffner &amp; Urania Sternwarte</th>
<th>Bringing astronomy to students before, during and after the corona pandemic</th>
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To supplement the on-site astronomical education, classes can visit the planetarium, the Kuffner- and the Urania observatory in Vienna. At the planetarium teachers can choose from different shows to match the curriculum and to find the program that is suited for their educational aims. Our institution not only focuses on astronomy, astrophysics and space-related topics, but also on the basic physical topics that are part of the Austrian science curriculum. Featuring experimental shows about e.g. hydro- or thermodynamics we are able to combine the theoretical education with hands-on experiences in order to create a science communication setting that cannot be offered in a standard classroom or physics room. Using the two public observatories we also allow for direct observational experiences for the students including solar science, observation of the night sky or even insights to the historic approaches of astronomy. We also offer a program for science education in kindergarten visiting the kids on site over the course of a semester. During the corona pandemic the planetarium and the observatories were temporary closed as well as schools were. Further, excursions were not allowed. Thus, we started to offer interactive webinars covering diverse topics. This offer will continue also after the end of the pandemic to supplement our program for schools. Webinars are especially suitable for classes that are not able to make trips to our locations. In our presentation we will give insights into our science communication program for schools with respect to the challenges posed by the corona pandemic and what we learned from it.

### Oral presentation

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<th>Jayant Ganguly, Manash Bagchi</th>
<th>Microblogging as an effective tool for astronomy communication</th>
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Astronomers and scientists have always been willing communicators. From Galilei's Discourse, Darwin's notebooks to the Brian Greene lectures or the CERN Twitter Page, explaining complex scientific ideas across both to colleagues and laypersons has been at the top of the agenda for practicing scientists. In the modern world social media is an alternate media where online users generate, hire and share media and use the content of Facebook, Twitter, WhatsApp, YouTube, Wikipedia, MySpace etc. for forming opinion and decision making. Using the two public observatories we also allow for direct observational experiences for the students including solar science, observation of the night sky or even insights to the historic approaches of astronomy. We also offer a program for science education in kindergarten visiting the kids on site over the course of a semester. During the corona pandemic the planetarium and the observatories were temporary closed as well as schools were. Further, excursions were not allowed. Thus, we started to offer interactive webinars covering diverse topics. This offer will continue also after the end of the pandemic to supplement our program for schools. Webinars are especially suitable for classes that are not able to make trips to our locations. In our presentation we will give insights into our science communication program for schools with respect to the challenges posed by the corona pandemic and what we learned from it.

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Microblogging share with "normal" blogs the sequential organization of information in dated entries, but they are usually constrained in length to 140-160 characters. However, soft adoption of mathematical lingo and incorporation of institutional level peer review can enhance the efficacy of microblogging as a coveted tool for creating public understanding of science and sharp short research declaration and discussion.
Podcasting is all about telling a story to your audience. This audio-only form of communication is a powerful and time efficient medium that people can enjoy while doing other things at home or at work, or while commuting from one place to the other. Podcasting has existed since 2005, and the audience has undergone steady growth across all ages as technology and internet access has reached more and more places. In this workshop, we will discuss how to select a topic to deliver, and how to present the topic in an easy to understand manner through the art of storytelling. No matter what topic you are engaging in, there is a way to fit your interview, your historical overview, or that new concept you want to teach into a three act story that will draw in your audience. Without doubt, since ancient times, people have loved telling stories. And word of mouth becomes a powerful way to engage others. By integrating podcasting and storytelling, podcasters can effectively connect to, persuade, educate, and entertain their audience. We will draw upon the myriad different voices of the long running 365 Days of Astronomy podcast to present examples of all kinds of content. Participants of all levels are encouraged to attend, although we will assume no past knowledge or experience. Come learn new strategies for your existing show, or dream up a future podcast. All participants are also invited to leverage what they learn to create content for 365 Days of Astronomy podcast as a case study and best practices for presenting many different kinds of content.
Workshop
Angela Zissimopoulos
Sadie Witkowski, Michelle Paulsen
Leveraging Virtual, Asynchronous Instruction to Teach Science Communication

SCAPE (Science Communication Online Programme) was launched in 2019 to reach STEM graduate students without access in-person science communication training. SCOPE is an asynchronous, modular online training program designed by science communication experts. While SCOPE was designed to be asynchronous, its modular approach allows for adaptation as part of a hybrid approach to science communication. We leveraged this feature in summer 2020, when all programming shifted to remote platforms due to the ongoing pandemic. In this workshop, we will briefly describe the history and development of SCOPE and illustrate how SCOPE was leveraged to convert Northwestern University’s in-person Research Communication Training Program (RCTP) into a synchronous, remote science communication training program. Participants will engage in activities selected from SCOPE including a brief video, a short article, discussion and brainstorming. Participants will explore the use of narrative techniques and provide feedback to one another. Following the activity, participants will receive evaluation results on the effectiveness of SCOPE and initial evaluation results from the first offering of the hybrid approach that ran in Summer 2020. At the end of the session, the participants will have sampled a new resource for remote skill development, received insight on how to integrate asynchronous instruction with synchronous, remote sessions of science communication training as a model for other similar offerings.

Workshop
Wandeclayt Melo
Natalia Palivanas, Mariella Patti
Creating Astronomical Images with the Hubble Space Telescope

The Hubble Space Telescope (HST) is arguably the most widely known astronomical observatory in history. After three decades of intense operation performing observational tasks proposed by the entire astronomical community, the HST has produced groundbreaking observational data that pushed forward our comprehension of the universe and also presented images of great visual impact to the public. These images create engagement and turn the telescope into a true celebrity. However, the process of creation of these images from raw data is less known, even by scientific literate audiences. In this workshop we show how to search, request, access and process image data from the HST archives, using a free professional software tool (SAO Image DS9) to demonstrate how the space telescope works and how data collected through optical filters in different bands the electromagnetic spectrum from UV to near IR may be combined into RGB images. The workshop may be attended by all audiences and no previous knowledge or experience in image processing is requested. Basic tasks proposed include the creation of planetary real color images, emission nebulae images from narrowband filter data and monochrome infrared images of the rings of Uranus. This set of tasks covers a wide range of techniques and visualization strategies, making clear that even though the choice of colors and stretch parameters may be arbitrary and motivated by aesthetic criteria, the resulting astronomical images are still “real” and represent data collected from true objects.

Workshop
Kelly Blumenthal
Pedro Russo, Lina Casa
Co-creation of a Future IAU Science Communication Training Workshop

As institutions across the globe begin to drastically increase their participation in public engagement activities, training for scientists to more effectively participate are on the rise. However, the approach that most trainers use for these workshops may not be effective. A recent study (Besley 2018) of training programs in North America showed that most training programs focus on tactical skills (e.g., becoming a better storyteller, learning to communicate more clearly) rather than strategic skills (e.g., goal setting, evaluation, Research (e.g., Besley 2020) suggests that developing these strategic skills might be a more effective way to create long-lasting outreach programs. Understanding how to implement this for a wide variety of communities is still the subject of ongoing research. The IAU presents a unique opportunity to probe the myriad contexts represented by our international community. At the end of 2020, we conducted a survey of IAU C2 members, Junior Astronomers, participants at the Shaw Conference, and the National Outreach Coordinators on their experiences in public outreach, in particular their interactions with the media. While the C2 members, Junior Astronomers and Shaw conference participants all provide the perspective of science communication practitioners, the NOCs were asked about and spoke to their broader national perspective. We received 127 responses to the survey from the community. Over 50 of these participants sat for an additional follow-up interview with the first author. In partnership with the IAU and the Kavli Foundation, we are in the process of developing a science communication training workshop. In this CAP workshop, we will present the latest research in science communication training, as well as the results of the survey and follow-up interviews and use this as the foundation for a community discussion. We hope to access the collective expertise of the CAP audience and request that participants in this workshop provide input into the content and format of the future training program.

Workshop
Samir Dhurde
Sonali Thorve, Atharva Pathak, Arvind Paranjape
"Zero Shadow Day" - a low-cost event for the Tropics

Imagine if you look down one fine day and your shadow has disappeared!! In about 100 tropical countries in the world, shadows do “disappear” (are minimum) on two days every year. The reason for this is that the Sun’s rays are perpendicular at local noon only on the day when it’s Declination is the same as the latitude of the place. Shadows are thus directly below you on that day and may become “zero” if you are a cylinder! This happens at all places in between the Tropics and makes for a great outreach opportunity for astronomy communicators there. It happens during the daytime, can be easily enjoyed by everyone, and there is no need for specialised equipment to show it. All that is needed is for the Sun to be shining on the Zero Shadow Day (ZSD) for the given latitude. >>Being inexpensive and appealing to all age groups, ZSD provides a good chance to talk about astronomy and do some daytime activities, even in remote places. There are several school level teaching/learning possibilities around this event. The tropics contain mostly developing countries, with astronomy outreach and education hardly getting any support. If taken up in an organised way, ZSD has the capacity to join communicators representing 40% of the world’s population, under one simple but overlooked event. >>The workshop will explain this occurrence, its potential and show some example activities that will make the participants self-sufficient and confident in organising it themselves. In fact, since this is virtual, we will also try to arrange for the participants to see a zero-shadow event happening at some location in India. We will also share lists of useful ideas and tools and have a brainstorming session to plan a ZSD event using them. Since we have experiences from India, where ZSD is run every year as a national campaign by various collaborating partners, the authors are willing to initiate action for organising this event all across the tropics and reporting it.
When protests erupted throughout the Hawaiian Islands in response to the Thirty Meter Telescope (TMT)'s attempts to begin construction, the Maunakea Observatories (MKO), the collection of telescopes already operating on Maunakea, confronted a multifaceted communications challenge. Of immediate need: crisis communications. The telescopes were deeply impacted by the protests, culminating in 2019 with a full shutdown of science operations undertaken out of concern for the safety of all parties as thousands of kiaʻi (anti-TMT activists) camped at the Maunakea Access road intersection. Internal communications at a previously unprecedented scale and sensitivity were required to support the 50+ MKO employees. Global media attention was at a fever pitch, prompting MKO to establish a crisis communications operational hub to effectively ensure the voice of the current astronomy institutions remained a key consideration in the international and local conversation. Personal interactions with opinion influencers and decision-makers was given priority as a critical community engagement imperative to ensure the MKO could emerge from the crisis with operational capabilities intact. But beyond crisis communications, the controversy and the impact to astronomy in Hawaiʻi made it evident that the MKOs needed to deeply examine their ongoing communications and community relations programs. While astronomy outreach in education settings had been robust and deeply appreciated, the social context in which the observatories were operating had fundamentally shifted; an adjusted approach was clearly needed. The MKO crisis communications working group, composed of cross-disciplinary experts, took on the near-term crisis communications work with dual intent: execute on the immediate needs while creating opportunities wherever possible to open channels of communication, collaboration and trust with key stakeholders to improve MKO communications and community relations into the future. Strategies were executed to deal with crises in real-time, while ensuring relationships were not put at undue risk. MKOs prioritized efforts to demonstrate credibility and trustworthiness to lay a foundation for productive interactions in the future. The crisis communications working group formed in response to these crisis needs has successfully led the MKO through the protests and transitioned the key lessons learned to strategic planning and proactive implementation for MKO communications and community relations underway today. The panel discussion will include experts from the Maunakea Observatories crisis communications working group: CFHT resident astronomer and astronomy group manager Nadine Manset, CFHT director of strategic communications Mary Beth Laychak, and MKO community relations program manager Christine Matsuda. The panelists will describe crisis communications preparation, execution, evaluation and forward planning in service of a resilient future for Maunakea astronomy.

Over a decade ago, two milestones helped set the course of the IAU outreach and public engagement programmes for the following decade: the unprecedented success of the International Year of Astronomy 2009 and the IAU Strategic Plan for 2010-2020, focused on astronomy for development. With the new IAU Strategic Plan 2020-2030 in place, the IAU envisions a clear core goal (Goal 4, from the IAU Strategic Plan 2020-2030) for the IAU outreach programmes, in which “the IAU engages the public in astronomy through access to astronomical information; (4) encourages communication of science and critical thinking through IAU member public engagement, professional-amateur, and citizen science activities; and promote dark skies and the pale blue dot message.” The role of the global observatories community professional and amateur astronomers, outreach professionals, educators and communicators will be essential to the success of the IAU outreach programmes. The role of the global observatories community professional and amateur astronomers, outreach professionals, educators and communicators will be essential to the success of the IAU outreach programmes. The role of the global observatories community professional and amateur astronomers, outreach professionals, educators and communicators will be essential to the success of the IAU outreach programmes. The role of the global observatories community professional and amateur astronomers, outreach professionals, educators and communicators will be essential to the success of the IAU outreach programmes.

As astronomy communicators and educators from across AURA’s Centers (Space Telescope Science Institute (STScI), National Solar Observatory (NSO), and NSF’s NOIRLab) we present our methods of confronting the challenges of the COVID-19 pandemic and how to maintain our outreach/engagement and event programming while keeping our audiences and staff safe. Specific examples both from the past year and future planning will be discussed. Five panel members will present and share examples of programs and events initiated or transformed during the pandemic. Topics will include: planning of the programming or event, execution and technological challenges, results and lessons learned, and how the learning from the past year will be applied to future events and programming. Some examples of projects to be presented: STScI: * Major pivot for Hubble 30th anniversary events, which occurred one month after COVID restrictions began * Distribution of resources to use at home through websites (e.g., NASA’s Universe of Learning at Home) and social media campaigns * Embracing new technologies has enabled broader engagement, including streaming previously local lectures, pre-recording talks for repeated use, and creating quizzes to add audience interactions * Conferences going virtual allowed for broader participation and greater accessibility in talks, but new mechanisms to maintain social interaction elements are still needed * Building on lessons learned and talking with informal learning venues to understand the new normal of community events in preparation for Webb launch NOIRLab: Virtual Programming * Live from NOIRLab, adaptation of long-standing existing virtual observatory “Field-trip” with emphasis on staff/stakeholder guests * En Vivo desde NOIRLab (Spanish Language), Spanish language version of Live from NOIRLab * CosmosView Videos, short “infovideos” on topics related to press releases Events * Journey Through the Universe, adaptation long-standing program (17 years) to virtual delivery and dissemination of public programs and classroom activities * Astro Day Chile (Spanish Language), adaptation for virtual implementation * Padre Picetti Prize, an annual award that recognizes a Chilean educator’s efforts in communicating science and astronomy. * AAS Virtual meetings Education * Teen Astronomy Cafe, virtual adaptation of existing in-person program with plans for longer-term virtual dissemination for broader national and international reach * La Serena School of Data Science, an intensive week of interdisciplinary lectures focused on tools for handling big astronomical datasets. NSO: Virtual Programming * Learn from home * Educational Videos Interviews * Google Classroom * Education Webpage Events * AGU * AAS. After the presentations, the panel will host an open discussion where everyone can share their ideas on communications and engagement during the pandemic and how these experiences will influence future programming.
The general idea that space is a man’s world is far from truth but still does not shadow the fact that the industry is male-dominated. Women and diversities play key roles in advancement of projects but the quantity is always low. In 2015 OECD survey showed that only 25% of workforce in STEM are women. While these data are only related to developed countries, statistics are worse in Middle East. Reasons behind low participation of diversities are almost the same around the world. However, countries react differently to remedy the inequality and encourage more inclusion. As for Iran, official statistics show that almost 50% of university entries for STEM during the past decade were women. Although there is no follow-up data about how the graduates end up in workplaces but the eventual result is clear and concise. Inequality is obvious. In order to specify the reader in a methodic survey using questionnaires and interviews a methodic design and implemented. Initial results will be presented in an event held by Space Generation Advisory Council (SGAC) in mid-June or early July 2021 with potential presence and speech of most significant women in aerospace in Middle East. Alongside rootin, potential solutions to bolster equality are also suggested. These solutions include two categories. (1) Methods that should be supported by government and (2) methods that can be implemented by NGOs or individuals. As for the first category proposed solutions are categorized as follows: (i) Legislations that support women grow into senior roles, fair recruitment and create opportunities for women (ii) Support empowering programs for skill training. (iii) Compatibility issues between workplace skills and requirements of STEM jobs are identified and modified. (iv) Programs that grant scholars and funds are designed to encourage more women in accepting responsibilities in different executive roles such as launching businesses. (v) Supporting Mentorship programs especially the ones that let young entries engage with accomplished women in the sector and learn closely. As for the second category and the solutions proposed by NGOs such as SGAC, are as follows: (vi) Inspire and maintain access for enthusiasts to be in contact with encouraging contents. (vii) Expand partnership and develop networks that introduces fresh talents to the industry. (viii) Holding events and promoting STEM subjects and heroes. The effectiveness of each solution is to be discussed in relevant panels during the aforementioned panels and similar experiences of active women in the sector will be shared.

**Poster M. Forkan**

**Shahjahan Mdridha, Jahangir Alam, Bappy Rahaman, Diben Bhattacharya**

**Astronomy Outreach Among the Rural Communities of Bangladesh**

Sreepur area, which is about 60 km from Dhaka, the capital of Bangladesh, is an economically disadvantaged area with the majority of people engaged in rural business, including farming, animal husbandry and retail marketing. Our organization – Anushandhitshu Chokro Science Organization – has been working with this target area through observational outreach programs using its Meade 8” and Coronado solar telescope for the past five years. Science education provided by the local educational institutions does not foster critical thinking or provide in-depth laboratory or outdoor observational work. Thus, only a few percent of high school graduates are up to the challenge of choosing a career in science, engineering or medicine. There is no science outreach program among the local adult population. In our survey 50% of the adult population identified the light of the stars as being reflected from the sun. Age-old customs, for example, that one cannot eat during eclipses, are prevalent. Furthermore, in recent years conservative anti-science ideas are gaining ground. Our approach is threefold: (i) engage the school-going children with astronomical observations and present on the school premises, (ii) reach out to the adult population with access to astronomy by inviting them to special astronomy sessions that include the showing of science documentary films, exploring mechanisms of eclipse, celebrating great scientists such as Galileo, etc. and (iii) encourage girls and women to take part in astronomical activities by highlighting women’s contributions to the field. We have been working with the schools of the area for the past five years and have developed an effective relationship with the teachers in order to fulfill goal (i). We conducted regular astronomy camps for adults for goal (ii). We are currently building a permanent Astronomy Center nearby which will house a 16” telescope with options for astrophotography, spectroscopy and photometry. (A grant from OAD was received for the instrument.) At the Center, we will have a permanent place to invite the local adult population, especially women related to goal (iii). Unfortunately, during 2020, we could not conduct many of these activities although our time and labour were directed to building the Astronomy Center. We did conduct regular Zoom sessions among our members and invited scientists to give talks. As Covid restrictions are gradually being lifted, we are returning to activities that are related to the above goals. We have a similar program, in Panchagar area, in the northwest of Bangladesh. Our goals include enhancing the rural population’s understanding of the world and to demonstrate the power of rational thought. By conveying a feeling for the scale and beauty of the universe, our goal is to give the rural population a broader perspective on our place in the universe than that acquired from their immediate environment.

**Poster Constance E Walker**

**Mark Newhouse (NOIRLab) and Huyen Nguyen (NOIRLab)**

**Communicating Astronomy with High Schoolers during COVID-19: Teen Astronomy Cafés**

Our world has changed due to COVID-19. As a result, online resources and programs for STEM education have become more prevalent. One of our in-person programs, Teen Astronomy Cafés, where students and astronomers meet to discuss timely science topics, has transitioned to an online forum. The goal of the Teen Astronomy Cafes program is to excite the interest of talented youth in STEM. One Saturday a month during the academic year, high school students interact with astronomers who work with big data. Students learn about killer asteroids, exoplanets, lives and deaths of stars, black holes, structure of the universe, gravitational lensing, dark matter, colliding galaxies and more. The format for each café is a short presentation by an astronomer, a computer-based activity and discussion. Students successfully explore the astronomer’s research through a Python activity. Typically, over 100 high school students are involved each year with over 30 teachers from 24 school local to Tucson, AZ, USA. Evaluations show positive views from students’ experiences and impressions of STEM. Online cafés on average score 9 out of 10 in student reviews. The last seven of our cafés have become e-Teen Astronomy Cafés. Initially, accounts on our server were available for local high school students registered for the cafés. In the summer 2020, the project began using Colab, as a simple means of running Python notebooks through a browser. In addition to 11 Python activities, we now also have a virtual Teen Astronomy Café Design Document to share with anyone interested in starting an e-Teen Astronomy Café program or using the activities in the classroom. Lessons learned on using the waiting room, breakout rooms, polling, facilitator cheat sheets, worksheets, google chat for facilitators, screen-sharing among students, are discussed. Breakout rooms act as comfort zones allowing students to ask questions more freely. The result is that students stay longer, and can continue to work remotely on the activity after the main café has ended. Good communication with school administrators, teachers, parents, and high school students is necessary to build the program within the community. Maintaining a team of graduate and undergraduate students, as well as high school youth leaders is key to a healthy infrastructure for successful cafés. Holding a practice session before the café to learn and review the upcoming presentation and python activity is critical. Support materials for our existing cafes are now being placed into packages per topic and will be made public as we expand the cafés to our other two NOIRLab sites in Hawaii and Chile.
How to Build a MOOC

Massive open online classes, or MOOCs, started in 2013 and have now reached over 200 million adult learners with over 18,000 courses. This talk will be a primer on creating a MOOC through one of the major providers, such as Coursera or Udemy, based on seven years of experience with three MOOCs that have reached over 180,000 learners in 180 countries. The core of a MOOC is video lectures. These are ideally filmed with a high-quality webcam, in front of a green screen or neutral background. Material should be structured into video segments about 6-8 minutes long, to match the attention span of most adult learners. A highly recommended free tool for recording video is OBS (Open Broadcasting System), open-source software that can record and live stream video, with the flexibility to combine webcam and slides and other media in a single frame. With this flexibility, the “talking head” video can be an inset within a PowerPoint slide, or set side by side with images and animations. It is important to make a storyboard for the class, try to hit the sweet spot between a script and adlibbing, and remember to emphasize people and stories to give a narrative structure to the learner experience. Most MOOC providers allow low stakes quizzes to be inserted within the video stream, so learners can check their knowledge as they go along. The typical range of total video time for a MOOC is 10 to 20 hours, through successful science classes as short as 6 hours and as long as 24 hours are possible. The pedagogy that works well in an astronomy MOOC includes citizen science projects, peer writing assignments, and the use of social media and discussion boards. Completion rates of MOOCs are generally low, since adult free-choice learners often have jobs, families, and busy lives with many priorities to juggle. An important lesson from MOOCs is that engagement drives completion. Having learners complete a survey of do even the first video quiz raises the completion rate by a factor of three. If they do the first writing assignment, a project, or participate in the discussion forums, the completion rate goes up by a factor of six to eight. Coursera offers completion certificates for $100, which can be a motivator for some people. No special skills or equipment are needed to build a MOOC. The effort required is significant but not prohibitive; one person working half-time aided by a student assistant can create one in 5-6 months.
The sun is the most popular star for us. Therefore, the public have high interests in the solar activity as ever. In fact, in the previous 24th solar maximum (2009-2020), when the solar eclipse, the big sunspots, and the huge solar flare occurred, the public including mass media pay intense attention to such solar phenomena. In addition, the public have high interests in the relation between the solar activity and climate change on the earth. Since solar observation satellite "Hinode" was launched in 2006 and even now, the observation data has been used on the astronomy communication scene in various ways. After that, STEREO and SDO were also launched and similar activity have been done on the astronomy communication scene. In Japan, with these solar observation data, we have been promoting public use of Hinode data working group and joint observations with high/junior high schools. Teaching materials with Hinode data have been developed and used in the class room practice. These activities have drawn the attention of solar researchers at home and abroad. From now on, the next 25th solar cycle is coming, the solar activity will be active again. New solar observation spacecraft, Parker Solar Probe (PSP) and Solar Orbiter were already launched towards the inner heliosphere. PSP has already new findings about the interesting structures of solar wind as initial results. DKIST is also operated as the solar ground-based solar observatory. In Japan, Solar_C_EUVST is planned as a successor of Hinode. It is expected that we can obtain new high spatial resolution data and new information of the heliosphere from these current and future observation instruments next by next. In particular, the solar phenomena as solar flares, CMEs, solar wind have influences on the near-earth space. If the solar research make progress with the new instruments in future, we can deeply understand space weather relating our life. Moreover, that might lead to new knowledge between solar activity and climate change. Thus we would obtain the opportunities to communicate the new solar astronomy with the public. In this virtual conference, we would like to opportunities for not only reflecting our and others' astronomical communication to date but also generating new method and idea based on the new coming solar data in the future. In addition, we would also communicate the relation between the solar activity and climate change among the participants.

The COVID-19 pandemic scenario brought public observatories and planetarium sessions to a halt in their activities all over the world. The unclear perspective of the reopening of these spaces under the high rates of new cases in Brazil motivated the collaboration between the astronomy communication and outreach project Céu Profundo and the Astronomical Observatory of the Universidade do Vale do Paraíba (UNIVAP) to create content and engage the audience which once attended the public talks and observation sessions with online content. Céu Profundo provided personnel and expertise to train grad students and to install and operate an SBIG STT-8300 CCD camera, attached to the observatory's 305 mm SCT telescope. The University provided the observatory facilities and infrastructure to acquire and broadcast data and images of events such as the passages of the comets C/2020 F3 (NEOWISE) and C/2019 U6 (Lemmon), occultations of Mars by the Moon, and many planetary conjunctions, generating engagement and reaching a broad audience. The use of images acquired in the observatory and the appearance of researchers, professors, and grad students on broadcast sessions raise awareness of the research conducted in the astronomy department in the university and of the grad courses in astronomy and space physics. Ground-breaking discoveries such as the presence of molecular water in the crater Clavius in the Moon and of phosphine in the atmosphere of Venus were also reported generating great traffic in social media accounts for the Observatory and the Céu Profundo project profiles. The arrival of the rover Perseverance on Mars was also a major event to engage with a new audience with an overall growth of 22% of Twitter followers in the weeks following the event, doubling the average growth rate of previous months.

The LIGO Magazine is a twice-yearly publication from the LIGO Scientific Collaboration. It features news from around the gravitational-wave community, personal stories, interviews, advice, and more! It is free to read online and is aimed at both the gravitational-wave community and the public. Large international collaborations produce inspiring results and incredible technology that capture imaginations around the world. Gravitational-wave observatories and their results are no exception: from the detections of merging black holes and neutron stars billions of light years away to the phenomenal technology and development that makes LIGO, Virgo, KAGRA, and GEO600 a reality. The LIGO Magazine not only summarises exciting gravitational-wave results and news, but also emphasises the personal stories behind the science. From long hours commissioning the detectors and being woken up in the middle of the night by gravitational-wave detection alerts, to alligators at LIGO Livingston and tumbleweeds at LIGO Hanford! The LIGO Magazine features a regular early career researcher advice column and catches up with past collaboration members on the wide range of jobs they are working in now. It also shines a spotlight on the many engagement and outreach activities taking place around our global community from science exhibitions, and engaging undergraduate and school students to online blogs and art/science collaborations. Check out www.ligo.org/magazine to find out more!
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<td>Constance E Walker, Mark Newhouse</td>
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The realities of COVID-19 have changed our world in many ways. One of those is an increase in demand for online resources and programs for STEM education. This led to assigning greater importance to the promotion and implementation of these programs, including online citizen science programs such as Globe at Night. Globe at Night (GaN) is an international, online citizen-science campaign to raise public awareness of the impact of light pollution by inviting citizen-scientists to measure and submit their night sky brightness observations. This year we made a concerted effort to increase engagement with our partners in order to get the word out, resulting in a record year for the number of measurements reported. Coupled with increased, targeted, interactive presentations and best practices that involve thematic approaches under COVID-19 conditions, by the 10-day campaign in September, GaN exceeded its own annual record. By the end of 2020, over 29,500 measurements had been recorded for the calendar year. In the first 2½ months of 2021 an additional 6,500 measurements were recorded. The engagement of 96 participating countries in 2020 testify to the robustness, accessibility, and inclusiveness of the program to international participants. As an example of our partnerships, what began as an effort to gather more data for a researcher at the GFZ German Research Center for Geosciences to do analyses of light pollution in 2011 versus 2020, evolved into two themes for February 2020 and 2021: “Love Your Stars” and in March 2020: “Pi in the Sky”. In April 2020 and 2021, the GaN Team partnered with SciStarter for Citizen Science Month, as well as Astronomers Without Borders (AWB) for Global Astronomy Month (GAM). The partnership with SciStarter also included monthly webinars with libraries across the USA. The May 2020 GaN campaign focused on the International Day of Light and the International Dark-Sky Association’s (IDA) good lighting practices. However, the June GaN 2020 campaign exceeded all expectations, with nearly 8,000 observations within the 10-day campaign. 6,700 of those observations came from one night, June 21, due to the partnership with the Australasian Dark Sky Alliance. Spain had the third most measurements in the world in 2020 (over 3,400), not from the Spanish mainland, but from the island of La Palma (around 700 square kilometers) in the Canaries. Grabbing the attention of the public and citizen-scientists relied heavily on the products and methods provided by the Graphics and the Communications groups at NOIRLab. Their ingenuity created social media, announcements, articles, videos, webinars, and graphics that helped increase numbers. For example, graphics illustrating the steps to measure night sky brightness were produced for the March 2021 campaign and posted as the March 5 Facebook entry for NOIRLab. The post was shared with AWB for GAM, SciStarter for Citizen Science Month, and the IDA for International Dark Sky Week.

Planetary science public engagement often relies on visual and audible resources and activities which can exclude SEN audiences. Our project, Sense the Universe, promotes accessibility and inclusion by producing sensory learning resources and demonstrations relating to the habitability of planetary bodies in our Solar System. This is done via online resources that include videos for recreatable sensory demonstrations and fact sheets, teacher training CPD sessions and public and conference talks. This project has created easily reproducible educational resources for home and school environments, primarily targeting the SEN community, but accessible to all. Resources have been created from inexpensive and easily obtainable materials to reduce the barrier to entry in reproducing activities at home or in school. This project also promotes role models in planetary sciences with learning difficulties, to promote accessibility in planetary sciences and science in general. By providing access to prototype resources during the conference, we also hope to gain feedback on our resources to help this project progress to spread accessible education across the globe.

The correct scientific conceptual understanding of circular motion is important in developing foundation knowledge for students who pursue majors in astrophysics, road engineering, and other related fields that use the application of this concept. This study sought to develop an Inquiry Learning Space (ILS) that is tailored towards addressing students’ misconceptions about circular motion. The study also investigated the impact of the ILS in the conceptual understanding of circular motion among first-year students at Copperbelt University. The ILSs were designed on the Global Online Laboratories (Go-Lab) Ecosystem. In this quasi-experimental design, 171 first-year students at Copperbelt University were randomly assigned to the experimental and control settings. The intervention was developed by arranging inquiry activities that would encourage students to probe on the five identified misconceptions. The control setting ILS required students to engage in inquiry following the syllabus outline only. The participants were taught the topic on circular motion along with equivalent parallel forms of pretest and post-test adapted from Ching (2001). An analysis of co-variance was conducted to compare the performance between the two settings. The test was found to be significant, F(1,168)=21.520, p=.000, M=50.8119, SD=19.8. The results revealed that the ILS geared towards addressing students’ misconceptions facilitated more engagement in conceptual change but with a low effect size. It was further recommended that inquiry learning activities should be tailored towards addressing particular needs of learners for them to effectively understand the topic on circular motion.
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<th>Himansu Sekhar Fatesingh</th>
<th>Communicating Astronomy in Hands-on way with Samanta’s Instruments</th>
<th>Samanta Chandrasekhar (1835-1904) was one of the great Indian astronomers of the traditional school in the rank of Aryabhata, Varahamihir, Brahmagupta and Bhaskaracharya. He was possibly the last greatest naked eye astronomers of the world. He often remembered as Tycho of India. He had made some simple astronomical instruments for astronomical observation and calculation, using easily available materials like wood and bamboo chips. In this paper five of the traditional instruments presented which have immediate relevance. These instruments are 1. Dhanu yantra (Sky cross) 2. Sanku (gnomon) and Horizontal Sundial, 3. Chapya Yantra (Equatorial sun-dial), 4. Gola Yantra (Armillary Sphere) 5. Mana Yantra (Measuring instruments). With the Dhanu yantra, the angular separation between the stars and other heavenly objects can be measured. Shanku is a vertical stick, whose shadow will measure a number of astronomical parameters such as declination of the sun, longitude of the sun, latitude from the equinoctial shadow. Horizontal Sundial can be used to measure local time. Chapayatra was used to measure the local time as well as the standard time. Gola yantra is an instrument used to measure the angular position of celestial bodies and to demonstrate the motion of planets. Mana Yantra is a T-shaped instrument which can be used to estimate the height of a distant mountain. Samanta used to measure latitude of a place, angular distance between heavenly bodies, local time, positions of celestial bodies, angular distance, height of distant objects and other astronomical parameters with a great accuracy using these instruments. With these instruments Samanta observed, verified and made necessary correction over the traditional Indian astronomy. These instruments are very simple, inexpensive and made up of easily available materials. Also these instruments can be made and used by the school going children and can be helpful in leading concept attainment in astronomy. These are the few simple instruments which may be supplemented with a sextant and an astronomical telescope for making our schools active centres astronomical observations. For calculations, a normal scientific calculator is adequate. However these instruments have remained unnoticed due to language constraints. This paper is an attempt to interpret and construct all these instruments made by Samanta based on his book Siddhanta Darpana. Working principles and applications of these instruments are also included in this paper. Also an attempt has been made in this paper to highlight the importance of these instruments in astronomy communication and astronomy education in present time. So it can be said that the Samat’s instruments can solve a long-standing problem, the lack of low cost astronomy kits suitable for astronomy education and amateur astronomical observation. These instruments may be introduced for the use in astronomy education and astronomy communication in the developing nations.</th>
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<td>Poster</td>
<td>Arianna Piccialli (1)</td>
<td>EPSC 2020 Planetary Science Wiki Edit-a-thon</td>
<td>Background Wikipedia is an open source, web-based encyclopedia, allowing anonymous and registered users to create, edit and improve articles. A survey in 2018 showed that as many as 90% of Wikipedia’s editors were male and as many as 81% of contributors were from the Global North [1]. In addition, there are fewer contributions about women, especially in STEM fields, and they are usually less developed [2]. In October 2014, only 15.53% of English Wikipedia’s biographies were about women [3]. The WikiProject Women in Red was founded in July 2015 with the objective to address this gender bias in Wikipedia content. They succeeded in increasing the above-mentioned percentage to 18.71% as of 11 January 2021 [2]. Today, Wikipedia is within the 20 most popular websites [4] and every month it attracts more than 1 billion unique visitors [5]. Wikipedia therefore has a huge potential to change publics perception of who is doing science and what a scientist ‘looks’ like. (Women) planetary scientists on Wikipedia? In June 2020, there were only 189 planetary scientist biographies on the English Wikipedia, including 48 biographies of female planetary scientists (25%). This percentage is in agreement with the percentage of women in the International Astronomical Union from all ESA’s Member States (24%) [6], but planetary scientists are clearly underrepresented on Wikipedia. Many of them either do not have a Wikipedia biography yet, or if they do, they are often misclassified under the category of “astronomers” or “astrophysicists”. A Planetary Sciences Edit-a-thon The Diversity Committee of the Europlanet Society aims to highlight diversity within the planetary science community. Therefore, they organised, in collaboration with Women in Red and WikiDonne, the first Planetary Science Wiki Edit-a-thon during the Europlanet Science Congress (EPSC) 2020 [7]. An Edit-a-thon (‘edit marathon’) is an organized event where editors from an online community (such as Wikipedia in this case) write, translate and improve articles on a specific topic [2]. Thirty persons received a basic editing training, resulting in 1 new article and 5 translated ones. A small subgroup still meets every month to continue the project. References [1] <a href="https://meta.wikimedia.org/wiki/Community_Insights/2018_Report">https://meta.wikimedia.org/wiki/Community_Insights/2018_Report</a> [2]<a href="https://en.wikipedia.org/wiki/Wikipedia:WikiProject_Women_in_Red">https://en.wikipedia.org/wiki/Wikipedia:WikiProject_Women_in_Red</a> [3] Eduardo Graells-Garrido, Mounia Lalmas, Filippo Menczer, &quot;First Women, Second Sex: Gender Bias in Wikipedia&quot;, arXiv, 9 February 2015, p. 3. [4] &quot;Wikipedia.org Traffic, Demographics and Competitors&quot;. <a href="http://www.alexa.com">www.alexa.com</a>. Retrieved October 1, 2019. [5] <a href="https://stats.wikimedia.org/#/all-wikipedia-projects">https://stats.wikimedia.org/#/all-wikipedia-projects</a> [6] Piccialli A., et al., Participation of women scientists in ESA Solar System missions: a historical trend, Adv. Geosci., 53, 169–182, <a href="https://doi.org/10.5194/adgeo-53-169-2020">https://doi.org/10.5194/adgeo-53-169-2020</a>, 2020. [7] <a href="https://www.europlanet-society.org/epsc-2020-planetary-science-wiki-edit-a-thon/">https://www.europlanet-society.org/epsc-2020-planetary-science-wiki-edit-a-thon/</a></td>
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Using Google Earth and software and practical activities are also suggested. Overall, users are provided with an immersive experience which is hoped will motivate them to connect further to the laboratory. For thousands of years humans have used the stars, sun and moon to find their way home. Examples of simple but ingenious techniques for navigation were developed and deployed by travellers ranging from the ancient Greeks, to the Polynesians and the Vikings. Nowadays technological solutions such as GPS navigation are used instead, but the traditional methods of finding one’s direction can still fascinate and therefore provide an excellent way of motivating the general public to become interested in Astronomy.

Poster

Kangwa Alex Nkonde
Prospery Simpemba, Dennis Silungwe, Anthony Bwembya, Jones Chilufya
Use of Social Media to Enhance Astronomy Outreach: Case Study of Zambia

Authors: Kangwa Nkonde, Prospery Simpemba, Dennis Silungwe, Anthony Bwembya, Jones Chilufya, Emmanuel Muteba, Daliso Banda & Oday Chibala

Introduction: The last decade has seen increased interest in Astronomy in Zambia. This is mainly due to Zambia being one of the participating countries in the African VLBI Network (AVN) and Square Kilometre Array (SKA) projects. To increase local participation, SKA UK and SA through organisations such as Development in Africa with Radio Astronomy (DARA), South African Radio Astronomy Observatory (SARAO), and other cooperating partners have set aside funding to help bridge the knowledge gap in Astronomy and allied fields. Furthermore, there have been outreach programmes aimed at raising public awareness and motivating university, college, and high school students into STEM fields and ultimately Astronomy.

Methodology: This work analysis the approaches being devised to carry out outreach in the Country. Comparisons between the utilisation of social media, normal public engagement, astronomy demonstration, career talks and one-on-one engagements are analysed. The long-term impact of these techniques is analysed as well.

Poster

Persico Amalia
Hands-on astronomical activities in covid times

During the pandemic in Italy, all activities of museums and planetariums were suspended due to the lockdown. Communicators had to face the problem of how to transform laboratories taking into account health restrictions and social distancing, and move them to online activities. Numerous problems arose. For example, in the case of face-to-face workshops, the operator has to keep the distancing from the students, going back to a frontal lesson style, which is known to be less engaging and productive. Furthermore, sharing of materials is now forbidden and careful sanitation is required, which has led to an explosion of costs and time required to prepare the activity. Also sometimes there is no possibility of keeping the-hand made object as a pleasant memory of the laboratory, because any experiment has to be thrown away and cannot be taken home by children. There are also many problems with online laboratories. A much more demanding organisation is needed since parents have to be involved as well, to explain the necessary materials, the main steps and the procedures.

Consequently, organisational times can explode. The operator is placed in difficulty because the children seek attention and want to communicate with the speaker, and the allocated on-line time for the lab does not allow for any digression. It is also extremely complicated to check many screens at the same time, and to follow the steps of the hands-on activities for all the children participating in the workshop, keeping track of whether they have assembled the pieces or performed the steps correctly. As a consequence, there is a drastic limitation to the number of participants. Last but not least the problem of internet communications with imperfect audio/video signal is added. Based on my experience I have found the following possible solutions: - In order to let the children actively participate in the online workshops I created questions in the form of multiple choice quizzes; - I kept a fun approach to the topic and gave a focus on key words and basic concepts. To avoid a “boring frontal lesson” effect during face-to-face workshops constrained by distancing, I adopted the following solutions: - I built board games; - I organised round tables to discuss the concepts - I made extensive use of storytelling to fix the most important concepts. Conclusions: I found that, in the case of online teaching, the children feel empowered and react positively to the stimuli of the laboratory by carrying on the projects even after the end of the activity, rather than abandoning them there. The positive side is that the activity involves the student before, during and after the hours of the laboratory, therefore it stimulates the active understanding of the problem and helps the development of problem solving. This type of solutions allow to keep the student with an active and curious approach towards the laboratory.

Poster

Vassilios Spathopoulos
Navigating with the stars: Using Google Earth and Stellarium to teach elementary principles of celestial navigation

For thousands of years humans have used the stars, sun and moon to find their way home. Examples of simple but ingenious techniques for navigation were developed and deployed by travellers ranging from the ancient Greeks, to the Polynesians and the Vikings. Nowadays technological solutions such as GPS navigation are used instead, but the traditional methods of finding one’s direction can still fascinate and therefore provide an excellent way of motivating the general public to take up astronomy as a pastime. With this in mind, an innovative set of online tasks has been developed using a combination of Google Earth and the Stellarium planetarium software. Both software applications are free to use and are available in web versions, making them easily accessible to anyone with an internet connection. The tasks take the user on a journey around the world (using Google Earth) and also back in time. The ancient Phoenicians, Greeks, the Vikings and the Polynesians are all encountered revealing their methods for using the stars, sun and moon to find direction. Their techniques are implemented using the Stellarium software and practical activities are also suggested. Overall, users are provided with an immersive experience which is hoped will motivate them to connect further to the wonders of the sky.

Poster

A-In Cho
Haem Jeong
Successful operation of the Teacher Training Program

The “Teacher Training Program” is an old program dating back over two decades. The program has received more than 90 percent satisfaction rate from participating teachers in each session. Why is the Korea Astronomy and Space Science Institute(KASI) so attached to the program to educate teachers? We run the program with a maximum number of eighty teachers each time. Assuming that there are 30 students per teacher, we believe that will amount to educating 240 people. (80x30=240)

What I’d like to say in this presentation is: (1) how to operate a sustainable program (2) how the curriculum has been organized, and (3) methods of operating programs with high satisfaction.
| Poster | Raúl Mújica | Vicente Hernández, Hernán Herrera | From the classroom to the Universe: a telescope for each school | This program started as a collaboration between a research institute (INAOE), a public university (BUAP) and a telescope seller (Celestron). The initial idea was to distribute one hundred telescopes to high schools only in the state of Puebla, in the center of Mexico. However, the program was quite successful and in four years we had already distributed more than one thousand, not only in this state but in other several more. Participating schools must create an astronomy club and report the activities they carried out with the telescope, not only inside the school, but also in their communities. In this work we show the development of the program in the state of Quintana Roo, at the Riviera Maya, where the local science council (COQCYT) has appropriated the program and now there are more than 250 astronomy clubs each one counting with a telescope that is shared it with the school community. |
| Poster | Prof. Dr. Susanne Hüttemeister | Daniel Fischer, Astrophysicist and Astro-Journalist; Jennifer Christoph, Communications at Planetarium Bochum | Planetarium@home": Digital astronomy outreach during the Covid-19 pandemic | The Planetarium Bochum is one of Germany’s largest, most frequented and modern multi-functional planetariums. It is known for programs ranging from educational astronomy shows for both adults and children, music shows and numerous live events covering scientific, as well as cultural and immersive live events. When the German government decided to implement the first national lockdown in mid-March of 2020, the planetarium’s communications team knew they needed to act fast and produce a consistent, educational as well as entertaining digital offer as to fill the gap of not being able to have any visitors for an unknown length of time. Correspondingly, we came up with a range of digital activities under the content bracket of „Planetarium@home“ online as well as on the planetarium’s social platforms Facebook, Instagram, Twitter and Youtube. One activity of many that needs to be highlighted here is the weekly video-series „Streifzüge durch das Universum“, which can be translated into „expeditions through the universe“ a highly educating science format delving into topics ranging from „the possibility of life on other planets“ to current astronomy events and news. |
| Poster | Nikita Bhakare | None | Introducing a diverse and inclusive Legal perspective while communicating Astronomy. | It is very often the case that Astronomy is only communicated and addressed to the public along the scientific lines keeping in mind the nature of this discipline. However, it is highly important to analyse and evaluate the practical perspective that stems from understanding the legal domain which intersects Astronomy, in order to sustain and propagate future practices associated with this subject. Furthermore it has now become a necessity to involve the legal community in the commercially diverse and dynamic age of Astronomy development to address potential challenges involved in the same for fostering a global and inclusive environment towards a sustainable successful communication-outreach framework. |
| Poster | Krzysztof Czart | IAU100 Activities in Poland | The poster will present various activities conducted in Poland during IAU100. The main activity was IAU100 NameExoWorlds campaign, which in Poland gathered the largest number of votes all over the world. An original idea beyond global projects during IAU100 was Astronomers in Schools (Wizyty astronomów w szkołach) project, in which professional astronomers were travelling to schools and meet with students and teachers of various level of educations during talks or workshops. A mobile exhibition of meteorites was another project carried out in Poland. We have also published Polish versions of IAU booklets “From Medicine to Wi-Fi. Technical Applications of Astronomy to Society” and “Light Pollution” and distributed them widely. Some other local and regional projects will be also presented. |
| Poster | Victor Vera Vargas, David Salinas, Daniel Gamarra, Aldair Portal | Teófilo Vargas, Lisbeth Gonzales, David Salinas, Daniel Gamarra and Aldair Portal | Astronomical Fridays, a Special Project of the IAU100, in times of pandemic. | The Astronomical Fridays is currently the longest-running series of outreach talks in the history of Peru. They are all dedicated to the popularization astronomy and space sciences. After being considered as a special project of the IAU100, organizing the Astronomical Fridays brought us a series of good practices and strategies, academic and technological, face-to-face and virtual, that prepared us, by chance, to continue our outreach activities in times of pandemic using social networks, practically without any troubles. We present some statistics of the participating public online during the first year of pandemic, as well as the effort made by professionals and university students of the Faculty of Physics of the Universidad Nacional Mayor de San Marcos, to make astronomy and space sciences available to many people as possible from home. |
| Poster | Pamela Paredes | Carla Fuentes | The Intergalactic Travelers Audio-Reading Club | This 2020 was a year where we have to be confined into our homes. Dedoscopio, an inclusive project dedicated to bringing tactile astronomy to the BVI community in Chile, had to stop traveling around the country. We created an accessible experience that can serve as an educational and entertaining activity for BVI-children, alleviating their struggle with the world-health situation and giving them insight on different popular astronomical phenomena inside their homes. Our strategy was to listen to an audio-book, where another kid narrates from its innocence and imagination the wonders of the Universe through online meetings. This followed by a sensorial experience, where the participants use their hands to absorb physical concepts of the astronomical objects, and a general discussion where they can share their own thoughts. We show that using minimal resources, we can learn about the universe, share with the children’s imagination and have fun. |
| Poster | Beroiz M, Camuccio R, Capistrán L, Castillo M, De los Santos V, Díaz M C, Hinjosa Lee A, Jette M, Martinez A, Martinez B, Mendoza W, Perez V, Rattray W, Reyes A, Sanchez E, Valencia M, Webb X | Carla Fuentes | Astronomy at the service of an American Hispanic community | We present the activities conducted by the University of Texas Rio Grande Valley Dr. Cristina Torres Memorial Astronomical Observatory (UTRGV-CTMO) and the South Texas Astronomical Society (STARS) in the times of Covid. In this poster we describe the nature of the different virtual and live events conducted by these two groups in a region historically underserved in the United States and particularly hard hit by the pandemic. |
Poster Kenzo Kinugasa
Kazuhiko Miyazawa, Hidemi Ide, Mitsuuru Hayashi, Chizuko Yoda, on behalf of the NRO staff
Open Campus at home in the year "Nobeyama Open Campus Day 2020"
Nobeyama Open Campus Day 2020 was held as an online event with the theme, "Open Campus at home in this year". This is one of the first online event presented by astronomical observatories in Japan. As a chance to popularize activities of the observatory, we held the Open Campus Day every year since 1983, the following year of opening Nobeyama Radio Observatory (NRO) of the National Astronomical Observatory of Japan (NAOJ). In 2020, we have 38th Open Campus which is one of historical events held in Japanese astronomical institutes. We had about 2,400 participants on average which are relatively many numbers as a local event. However, we consider two problems to have the Open Campus Day on-site in 2020. One is prevention of spread of COVID-19. Other is corresponding to change of NRO operation structures such as limitation of budget, manpower, and available area. We decided to hold the online event as one resolution of the problems. We wanted to continue the Open Campus Day and establish a style of online event. We prepared some live streaming contents such as lectures and telescope operation. Also, we made movies introducing NRO, radio telescopes, astronomers, and handicrafts. Participants can watch the live streaming and/or some movies on and after the day. Moreover, we prepared keyword rally, an event for communicating with participants. They look for and collect keywords in some movies and fill the answer and their impressions in the form to get original goods. As a result, the maximum number of same-time connection for live streaming reached about 820. Moreover, total number of views for all contents for three weeks was about 25,000. The number is more than the participants of onsite Open Campus Days so far. We introduce Nobeyama Open Campus Day 2020 as one example of the online events.

Poster Andrew Rakoci
Music Inspired by Astronomy
A new annotated guide by the present author (part of a series devoted to resources for enjoying or teaching astronomy) features over 250 pieces of music inspired by astronomy. The selection includes many examples, where both music and astronomy are given for the vast majority, and for which (or your study, and audiences) can listen to them without expense. Among the pieces included is: 1) A Hubble Space Telescope cantata, 2) eight rock songs about black holes with reasonable science, 3) a super nova piano sonata, 4) a musical exploration of the Messier catalog of nebulae, clusters, and galaxies, 5) a moving song about Stephen Hawking, 6) Moon songs by the Grateful Dead, George Harrison, and the Police, 7) piano pieces "for children with small hands" named after the constellations, 8) the multi-cultural piece commissioned for the 2004 Olympics that uses the myths about the constellation of Orion from many countries 9) operas about Galileo, Kepler, and Einstein, and many more. In this illustrated presentation with examples, we will discuss why astronomy has always been such a powerful source of inspiration for the humanities, and how composers of all kinds of music are using astronomical ideas and discoveries in our time. You can access the guide directly by going to: http://astromusic.rakoci.ca

Poster Muhammad Hafiz Ahmad Murta
Amirul Hazim Kamaludzaman
Data driven astronomy outreach ensures the right target group and better engagement to the public.
Pandemic covid-19 has impacted education institutions all over the world. Schools are closed and face-to-face teaching can be done only with strict regulation and SOP. New norms introduce new challenges. Educators are encouraged to online teaching. Due to the constraint to be with the student physically, Movement control order and banned gathering activities have halted astronomy outreach. Astronomy outreach needs to adapt to new norms and rethink approaches and craft new strategies to attract the audience. Lots of online classes and meetings have made the participant bored and start to avoid learning using online and social media. This affects astronomy free and public classes where outreach normally does it for free. To adapt with new methods of outreach using technology. Apadilangit; Universe Awareness Malaysia implementing data-driven outreach program to monitor our online presence and quality for the target group. Due to the likeability and engagement in social media and technology, we normally get the same audience during our online session. Data-driven outreach allows us to target a new set of outreach groups who have never been exposed to astronomy. The noise of the audience gets reduced. Kids and simple can get bored being taught with the same methods. New skills, approaches, and new applications are required to engage the whole new target where they are exposed to the information and familiar with the technology. New norms in Covid-19 requires technological engagement. Difficulties in targeting the right audience and avoiding the same bubble of community while doing outreach. Kids are too techy, simple engagement will make them bored. Challenge to create unique content in social media. Skills, approaches, and application in engaging viewers in online outreach. In this workshop session, we would like to share our knowledge on how a data-driven approach may help astronomy outreach to reach a good target and achieve the objectives.

Poster Dinara Khisiamova, Alexander Kuzin
Science Slam – one of pandemic ways to communicate astronomy
Science Slam is a format to communicate science. Usually slam take place in bars, rock-club, abandoned buildings, etc. Each speaker has exactly 10 minutes to present his own study. Scientists should make it simple, entertaining and engaging the audience as much as possible. Guests choose the winner by applause. The noise level is measured by a sound level meter. Science Slam successfully spread in Russia, USA, Ukraine and Belarus. For example, Science Slam in Russia is an association which together more than 20 cities since 2016. These cities organize Science Slam on regular basis and promote local Russian science and scientists. Additionally Science Slam Russia got an adapted TV-format on a federal TV channel and the official award of the Ministry of Education and Science of Russian Federation. In 2020 when all offline events were prohibited Science Slam Russia moved to online. During autumn different teams made 11 topic-based online events. One of them was about astronomy and related disciplines connected with the space exploration. 5 scientists from different cities presented their own studies. Topics were galaxies, gamma-rays, space debris, etc. We organized event in Zoom and had 85 guests (vs 166 registrations). The main challenge for us was to keep the Science Slam vibes. We suppose that we succeeded. There are 4 tips: 1) Astronomy is great for topic-based events, even during announcement activities we had high interest from potential guests and lots of questions. 2) Q and A session is essential. 3) Professional moderator and activities in chat are super. 4) Music and small-talks with the scientists before presentation, a little bit alcohol and screenshots from Zoom as a photo report are nice ways to keep offline vibes. 5) Break out rooms in Zoom are the best for networking and tet-a-tet communications during after party in the main room. Online events are not the same thing as Science Slam in offline. But now we know that everything is possible and in online you can ask questions about galaxies to scientists, laugh and meet new people in chat, make flashmobs, drink wine with the people around the world which love science. Thanks for that, lockdown.

Poster Ibe Kingsley
Using Multimedia, Social Media, Immersive Environments and Other Technologies For Public Engagement with Astronomy
ABSTRACT: In recent times, Multimedia, Social Media and Immersive Environments has become more popular way to interact with the public. This is a new method in communicating science to build interest, share ideas, encourage research, and get feedback via the internet. As a result, there is not abundant research on the impacts of Multimedia, Social Media, Immersive Environment and other Modern Technologies in delivering Astronomy information and education to the Public. In this paper we will reveal the impacts of Using Multimedia, Social Media, Immersive Environments and Other Technologies For Public Engagement with Astronomy, including its impacts on offline activities, either individual activities or common ones. As it appears to be very little direction on this context, potential issues that can affect the use of the above mentioned platforms by Astronomy Communicator will be also be reviewed.
Our poster is a report on how we combine cultural astronomy and Indigenous astronomy for our public engagement activities. We report on the rubrics that we use for measuring success. We make comments on the ways that cultural astronomy and Indigenous astronomy public engagement can be used to further the goal of creating a more inclusive astronomy. Adams brings indigenous star lore from the Arab speaking world to visitors of Lowell Observatory as well as audiences in Arizona. Garcia, the current president of the Société Européenne pour l'Astronomie dans la Culture (SEAC), reports on the public engagement activities undertaken at various SEAC meetings and the responses of the local attendees. Hamacher engages with indigenous and other communities in Australia sharing the ancient sky knowledge of the indigenous Australians. Lee engages with indigenous communities in the Americas through workshops that educate as well as create artwork related to indigenous star knowledge.

Since 2015, in conjunction with teachers and other educators, I have developed several IBSE (Inquiry-Based Science Education) type activities, designed to be ‘teacher-free’, as extended projects for pupils and students interested in aspects of astronomy and space science. These include the study of, and background to, open clusters and population studies of exoplanets. These projects use real data and allow students to explore the science of these objects as well as associated STEM topics such as graph plotting and measuring uncertainties. These projects allow exploration of data archives from the Faulkes Telescope Project and National Schools' Observatory. As a successor to these projects, I now present a Citizen Science project in astronomy, initially using robotic telescope data from Type Ia supernovae discovered by ESA’s Gaia Alerts program. Users are instructed how to perform browser-based photometry on these images using their data to add additional data points to the Hubble Plot, enabling them to understand stellar evolution and supernovae and ultimately measure the expansion rate and age of the Universe. The Gaia mission is scheduled to continue until 2024/5 and beyond that, we expect the LSST (Legacy Survey of Space and Time) at the Vera C. Rubin Observatory to continue providing more transient objects than the professional astronomical community is capable of dealing with into the 2030s. Based in South Wales, the Faulkes Telescope Project provides free access, via both queue-scheduled and real-time observations, to a global network of 2-metre, 1-metre and 0.4-metre telescopes. The National Schools’ Observatory (NSO) is located at Liverpool John Moores University. It has a mission to enable “Access to the Universe for All” and provides use of the 2-metre Liverpool Telescope on La Palma. Both projects have recently celebrated their 15th anniversary and both provide free access via the internet to 2-metre robotic telescopes. Each project contains supporting material on several aspects of astronomy, in particular extended projects to create colour-magnitude diagrams of open clusters and light-curves of variable stars, supernovae and transiting exoplanets. Other simpler activities are suitable for younger pupils and all are intended to further students’ knowledge of science and mathematics, while also improving computer literacy and communications skills, strengthening critical thinking and allowing them to experience real-world applications in science and technology and broader STEM (and indeed STEAM) topics.

In this contribution we highlight a tinkering activity proposed to local primary schools (Bologna Italy) during the first covid-19 lockdown when children were at home and experienced for the first time distance learning (from 25th February to the end of the school year). Our experience of tinkering activity during a pandemic was really challenging because we had to work fast, trying to design an “online hands-on activity” that sounds like an oxymoron, taking care of equity and democracy in education. Following the Tinkering Studio, we proposed a “classic” tinkering activity called Chain Reaction in which students had to build a domino-like path with all the material they found at home. We prepared videos with a few basic instructions for teachers and families to make this activity at home, to film it and share the videos with others and infrastructure to collect the video and some resources for the teachers. Obviously, we could not facilitate the activities, but we co-designed and we collected feedback from teachers. Definitely online learning is much less democratic than learning at school where kids from different backgrounds, gender and socioeconomic conditions can access the same materials, environment and facilitation. Operating school at distance strongly amplifies inequalities between students not just because of the availability of digital instruments (computers, connections) partially solved by school administrations, but also because at home children are immersed in very different environments that strongly impact on their learning. The neutrality of the school environment was lost and children were constantly immersed in very different environments that strongly impact on their learning. That is just wrong not just because some familiar environments are places where meaningful learning is inhibited but also because the parents have to mediate all children interactions and so the children are constantly immersed in their parents’ influence also during school time. Moreover, peer exchange during the activities was difficult. We found that the fundamental keys are again the teachers and their ability to facilitate the learning even more during these difficult times where the interaction is online. The online chain reactions are collected here shorturl.at/hksQ4 With this activity and other activities during pandemic (teacher training) forcibly online we challenged ourselves and we discovered that some of the strategies we developed to create a playful, meaningful and creative environment for learning can be reproduced and re-designed in the online environment. Waiting for the time when we will meet again to tinker in person with teachers and pupils, we are preparing online resources and courses to be used as support for teachers in the classroom. We advocate for meaningful and creative learning for all, helping teachers to develop strategies and tools to provide all children with instruments to grow.
I describe how to create astronomy outreach for underserved communities. Programs include: outdoor concerts/festivals (women, minorities) Astronomy Festival on the National Mall (AFNM; public families); Super Bowl, World Cup or Halloween star parties (women, young girls); Camps for special needs kids; Hospitals; Ronald McDonald Houses (RMH; low-income sick kids). Contact concert/festival organizers, hospitals, summer camps, RMHs to bring astronomy and adapt for local cultures. Lessons learned: Create partnerships with astronomy clubs, schools, parks, festivals, RMHs, hospitals, camps for special needs children; Plan for success, more people than expected; Plan for unexpected problems (weather, power loss, staffing); Test equipment before events; Use equipment and supplies that are easy to use, store, set-up, and take down; Have backup equipment; Create professional displays, posters, and exhibits; Position the displays for maximum visibility as teachable moments; Use branding and identifying signs; Social media to promote events; Team with experienced people to help; Create educator hand-outs and bookmarks (for information and identification); Demonstrate citizen science projects and hands-on activities for all ages. Music and Astronomy Under the Stars (MAUS, NASA-funded) brought astronomy to 70,000 music lovers since 2009 before, during, and after free/low-cost classical, folk, pop/rock, opera, Latin, Gospel, or county-western outdoor concerts/festivals. There was culturally responsive outreach at free events organized by the African-American and Hispanic communities. Concerts/festivals assure large audiences for shared family-learning experiences (500 – 5000 participants for audience of 1000-30,000 people; 60% families with many young children; 60% female; 20% seniors); The AFNM is the largest annual astronomy outreach event in the US (30,000 people; 8000 in 2019) and was started in 2010 with the White House Office of Science and Technology Policy. In 2019 the AFNM partnered with the Smithsonian’s Solstice Saturday program including a “Sun” logo cookie and a lemon-basil solar solstice gelato. MAUS and AFNM include: solar, optical, and radio telescope observations; image projection system; posters/banners, videos; hands-on activities; mobile phone imaging; promotion of lifelong learning with citizen science activities and information about astronomy clubs or science museums. 100 volunteer educators from the AAAS, AAS, AGU, APS, Chandra X-ray Center, NASA, NOAO, NRAO, NSF, NRL, STScI, USNO, (NASA) universities, and astronomy clubs did demonstrations. Astronomy for extremely ill/injured low-income, poverty-level, and minority children and their families staying at RMHs or hospitalized children undergoing medical treatments (NASA and IAU funded). Astronomy float in the 2009 NYC Columbus Day Parade honoring Galileo and the International Year of Astronomy.

### Poster: Donald Lubowich

**Lessons learned from high school in South-western The astronomy education for promoting #AstroAtHome discoveries using GMRT citizen science research and pandemic-proof model for #RADatHomeIndia : A Societies Research to Astronomy camps to promote diversity**

I describe how to create astronomy outreach for underserved communities. Programs include: outdoor concerts/festivals (women, minorities) Astronomy Festival on the National Mall (AFNM; public families); Super Bowl, World Cup or Halloween star parties (women, young girls); Camps for special needs kids; Hospitals; Ronald McDonald Houses (RMH; low-income sick kids). Contact concert/festival organizers, hospitals, summer camps, RMHs to bring astronomy and adapt for local cultures. Lessons learned: Create partnerships with astronomy clubs, schools, parks, festivals, RMHs, hospitals, camps for special needs children; Plan for success, more people than expected; Plan for unexpected problems (weather, power loss, staffing); Test equipment before events; Use equipment and supplies that are easy to use, store, set-up, and take down; Have backup equipment; Create professional displays, posters, and exhibits; Position the displays for maximum visibility as teachable moments; Use branding and identifying signs; Social media to promote events; Team with experienced people to help; Create educator hand-outs and bookmarks (for information and identification); Demonstrate citizen science projects and hands-on activities for all ages. Music and Astronomy Under the Stars (MAUS, NASA-funded) brought astronomy to 70,000 music lovers since 2009 before, during, and after free/low-cost classical, folk, pop/rock, opera, Latin, Gospel, or county-western outdoor concerts/festivals. There was culturally responsive outreach at free events organized by the African-American and Hispanic communities. Concerts/festivals assure large audiences for shared family-learning experiences (500 – 5000 participants for audience of 1000-30,000 people; 60% families with many young children; 60% female; 20% seniors); The AFNM is the largest annual astronomy outreach event in the US (30,000 people; 8000 in 2019) and was started in 2010 with the White House Office of Science and Technology Policy. In 2019 the AFNM partnered with the Smithsonian’s Solstice Saturday program including a “Sun” logo cookie and a lemon-basil solar solstice gelato. MAUS and AFNM include: solar, optical, and radio telescope observations; image projection system; posters/banners, videos; hands-on activities; mobile phone imaging; promotion of lifelong learning with citizen science activities and information about astronomy clubs or science museums. 100 volunteer educators from the AAAS, AAS, AGU, APS, Chandra X-ray Center, NASA, NOAO, NRAO, NSF, NRL, STScI, USNO, (NASA) universities, and astronomy clubs did demonstrations. Astronomy for extremely ill/injured low-income, poverty-level, and minority children and their families staying at RMHs or hospitalized children undergoing medical treatments (NASA and IAU funded). Astronomy float in the 2009 NYC Columbus Day Parade honoring Galileo and the International Year of Astronomy.

### Poster: Dimitri Veras

**Presenting Theoretical Research to Astronomy Societies**

Many astronomy societies are focused on observing the sky rather than theorizing about it. Consequently, visiting lecturers who discuss theoretical astrophysics may struggle to motivate their audience. Here, I will present strategies to improve this connection, particularly for a diverse society membership. Further, the monthly attendance at society lectures may vary significantly. Hence, I will suggest ways in which the lecturer can remain flexible and adaptable regardless of the attendance.

### Poster: Akshat Mishra

**#RAD@HomeIndia : A pandemic-proof model for citizen science research and discoveries using GMRT promoting #AstroAtHome**

With the ongoing pandemic in action, the task of communicating astronomy to the public has become challenging for all. Lockdowns imposed across the globe brought all outreach and educational activities to a complete halt barring large gatherings, thus motivating the need to rethink all online communications. Every resource material and activity slowly started shifting to online platforms and zoom calls along with YouTube Live streams took the place of podium talks. Many faced difficulties transitioning into an online era. But RAD@home Astronomy Collaboratory (India) for citizen science research, founded on 15th April 2013, was well established in the online education field and was already engaging university students and other astronomy enthusiasts in innovative and interactive ways, that too absolutely free of cost. With the support of 25 research and educational institutes, our collaboratory is growing at a steady rate and is currently 4500 members strong. This includes 150 e-astronomers and over 1000 e-astronomers trained in the week long RAD@home discovery camps, One Day RAD@home Astronomy Workshops and other short sessions, respectively. These e-astronomers further guide new members and continue astronomy discussion during the weekly e-classes. In these e-classes, we discuss specific astronomical targets as defined under #DailyGalaxyRobGC, where UV-Optical-IR-Radio images are prepared by attendees using a simple RGB image making tool on our website developed by RAD@home. This tool helps the attendees to easily overlay various surveys and contours on optical images to extract maximal information with minimal effort. They can also learn about many standard radio sources and interact within an audio-visual framework of the tool. As already acknowledged by Nature Index, Square Kilometre Array and International Astronomical Union, to strengthen citizen-science research in multi-wavelength astronomy, the model of RAD@home is a well-proven way for development via #AstroAtHome. We need to continuously seek innovative ways to engage the public not only through written text but also by making them see visually and listen to what they wish to learn in order to achieve a life of equality that we all deserve as taxpayers or as simple humans.

### Poster: Siwei Zou

**The astronomy education for high school in South-western China**

(min. 200 words) Our main goal of this project targeting high school astronomy education and outreach in South-western China. The target audience are students especially left-behind adolescents and their parents, science teachers in local high schools. The content of this project includes 1. train teachers with astronomy knowledge and research English; 2. train the teachers on how to provide psychology aid to 'left-behind' adolescents in Pingtang; 3. introduce the career path in astronomy education and research to the students. This project is in partnership between Peking University, Five-hundred-meter Aperture Spherical Telescope (FAST), Pingtang government, and Beijing Planetarium. The schools, students, local government are already exposed to the regional economic impact of the telescope, and infrastructure is available. This pre-condition gives an excellent execution possibility of this project. We will introduce the process of designing the courses for training the teachers and teaching the students to reach qualified online data with the virtual observational system. We will introduce the processes on how to make use of the nearby telescope resources for astronomy outreach and gain support from profit and non-profit organizations. Especially, the 'left behind' adolescents problem is a long-lasting issue in the countryside of China. It means children whose parents work in big cities for a living and have to leave their children in the countryside with their grandparents. Based on the Chinese government report "The spiritual status of Chinese left-behind children 2018", there are nearly 10 million left-behind children in China. Due to the poor education condition and absence of personal care from their parents, these children not only behave far below average in the compulsory education courses but also suffer psychological problems. Moreover, as affected by ancient traditions, female adolescents are more easily to be left at home. Besides astronomy courses, we also try to provide a psychology aid to these students and gain support from their parents.
The paper highlights the Astronomy outreach efforts of African Astronomical Society (AfAS). As the Public Relations and Education Officer for AfAS, I have been involved in the renewed efforts of taking Astronomy to the grassroots, to reach the millions of unreachd and under-served communities across Africa. With the widespread of unawareness of Astronomy among millions of African population, it has become imperative for AfAS to take a proactive approach towards a radical campaign to create Astronomy awareness, harnessing the efforts of the many Amateur Astronomy groups across the continent. Africa with under 20 population making up about 25% of the entire population, has a long way to go in raising the next generation of Astronomers that can very well compete with their peers from around the globe. In order to achieve this feat, there is an urgent need for a rigorous and deliberate effort to “catch the young”. This is the reason behind this renewed drive for achieving a widespread reach of Astronomy in Africa.

NARIT’s Communication for the Public on Astronomy, Technology and Innovation  NARIT has established effective communication across multiple platforms to best reach target audiences. In recent years, social media has had a great influence and plays an important role in shaping the Thai society. NARIT has been utilizing social media across multiple platforms such as facebook, twitter, instagram, and youtube channel as the medium for communications since 2011. Difficult and challenging astronomical concepts have been reintroduced in simple, yet informative and engaging displays. Currently (2020), NARIT has over 500,000 followers across multiple social media platforms and is steadily growing. This led NARIT to win the best brand performance on social media under government organization category in Thailand Social Award 2019 and reached top 3 finalists in the year 2020. NARIT also was among iCreator 100 with exemplary performance in year 2019 according to rankings gathered by Rainmaker. These results reflect the success NARIT has earned in communicating and promoting scientific awareness in Thailand at the level unprecedented before. The unique and specialized content in the field of astronomy and technology, supported by consistent and credible sources and colorful delivery has persistently garnered national attention. NARIT is also the sole organization with the most credibility in the field of Astronomy in Thailand. It has been widely accepted among all media and has been the source of important astronomical news. In the steps to follow, NARIT is expanding awareness and understanding of its continuing mission to develop advanced astronomy technologies via the existing channels and continue to improve its presentation to reach wider audiences. It is the organization’s hope not only to uplift the public awareness in science, but also create a general sense of appreciation that astronomy’s importance is beyond simple stargazing, but also is a vital tool to improve Thailand’s technological capacity that can further benefit the future of a nation.

NARIT in Bangladesh  Bangladesh lacks any sort of infrastructure regarding astronomy. Neither the universities, nor schools or any governmental science and research institutes teach or conduct research in astronomy or related fields. As such, it is extremely difficult to secure funds either from private sector or from the government. There exists a positive feedback loop - no astronomy research, hence no funds; since no funds, hence no astronomy teaching / research / activity. Under these circumstances, the Office of Astronomy Outreach within the International Astronomical Union initiated the idea of the National Outreach Coordinators (NOCs) for each country. The NOC office in Bangladesh (NOC-BD), since 2017, recruited some university students as national volunteers to work for the enhancement of astronomical ideas to the general public. The responsibility is absolutely voluntary and the tenure is annual. The 10 national volunteers recruited for the year 2019-20 worked throughout the country and implemented the IAU mandated events within the limits of meager resources (financial and material). They helped the NOC-BD to disseminate astronomical ideas, write reports, organize local youth, coordinate events such as designing school activity programs for children, primary astronomy workshops, naming exoplanet campaign, arranging press meetings, writing short press for popular science, exhibiting with the IAU100 Above and Beyond posters at various schools, and other events. All these without any external funding. Hence, it could be an example of "good practices" to involve and engage young people for such volunteering activities, at the same time ensuring capacity building in basic understanding 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. Other limited-resource NOCs (or the newly established national astronomy education coordinators) could use this idea to get some actions going. This paper presents the idea of national volunteers and how this concept helped the NOC-BD office to carry out some of the IAU mandated campaigns in Bangladesh.

Virtual reality as an astronomy outreach tool  Everyone attending this conference appreciates the beauty of Hubble or Chandra images. But those photos don’t tell the whole story, since they are 2-D representations of 3-D objects. Virtual reality (VR) for the real world, leading to more memorable engagements and deeper understanding. Regardless of background or level of astronomical expertise, getting swept up by a supernova blast wave is exciting! In this talk we will describe a VR experience developed by my group in Japan, and how we have used it to present real 3-D scientific data to the public. While a hands-on demo is not possible in an online-only conference, we are happy to offer guidance and suggestions about how to start your own VR outreach journey at your home institution.

Poster reDesign Workshops: How to make effective posters for impactful science communication  One of the main ways to communicate (scientific) results or ideas with peers, is through poster presentations during conferences and meetings. But the way that traditional posters are designed and presented, is often ineffective. That’s why Iris Nijman, Senior Science Editor at the European Space Agency (ESA), and Jeff Hellerman, Art Director at the National Radio Astronomy Observatory (NRAO), have been piloting a workshop to try and change the dynamic of poster presentations. We have been organizing workshops with scientists to talk about why traditional posters might be ineffective to communicate their science, and then we addressed two aspects that can make posters more effective: visual design and content. Jeff taught scientists about typography basics, such as font styles, contrast and the use of color, and how to establish a visual hierarchy in their poster design. Iris taught scientists the basics of storytelling, how to distill a main message, and what questions a poster should generally try to answer. We then asked the scientists to redesign their traditional poster and to present their redesigned and traditional posters side-by-side as a comparison. Based on our first workshops, we already learned that the basics of poster redesign can also be applied to presentations in general. We also believe that scientists who can create effective posters and presentations, are better prepared to talk to the public and media about their research. Since these workshops were new for us, we have asked the scientists for feedback. We would like to share our best practices and learning points with CAP participants, as well as teaching our own audience the basics of visual design and storytelling.
Poster Aiolfi Taylor Pedro Russo, Frans Snik

Powers of Ten: Connecting astronomy to other fields of knowledge through a sci-art concept

In 1957, Dutch educator Kees Boeke published his book 'Cosmic View: The Universe in 40 Jumps'. The book takes the reader on a journey through the Universe in jumps of powers of ten to as large as the edge of the observable Universe and down to the inner workings of the atom. The structure and perspective the book provides has inspired many adaptations, including the infamous 'Powers of Ten' films by Charles and Ray Eames (1968,1977), which brought this seminal framework of exploring the Universe to popular culture. 'Cosmic View' itself is thought to have historical connections to Dutch astronomer Hendrik van de Hulst, with these connections demonstrating that the framework is deeply rooted in history and the continuous evolution of science. This layered sci-art concept, with interdisciplinarity at its core, can now be found across many fields of knowledge, both within and outside of science. Its adaptability allows users to fit the framework to different narratives, in order to communicate abstract concepts, especially those that deal with the very large and very small, in a relevant and comprehensible manner to the public. It also offers the opportunity to convey powerful messages such as those relating to global citizenship, due to the awe factor that often comes with that first true sense of scale. This poster will investigate the use of the Powers of Ten concept to communicate both new and important developments in astronomy, and to demonstrate its connections to different fields of knowledge and its relevance to society. One of the goals of this current work is to explore all realms of science and society to elucidate the omnipresence of the Powers of Ten. This work is currently being carried out to help develop the content for a 2022 exhibition, as part of a project by Leiden Observatory and the sci-art platform ORBITAT. The poster presentation will begin with a brief discussion of the origins and the nature of the Powers of Ten conceptual framework. It will then delve into applying Powers of Ten to different topics in astronomy, where we must consider aspects such as the dimension of scale, visualisation, connections to other disciplines and the message portrayed. This poster will encourage creative and collaborative discussion, allowing CAP2021 participants to consider the communication of astronomy topics from new perspectives. It will provide a method that may inspire others to consider communication tools based around interdisciplinary connections. Any input from participants will also be invaluable to the creation of content for the upcoming exhibition.

Poster Tony Thompson Rosie Cane, Paul Boche

Educational Resources for the EPN24 Planetary Field Analogue Sites

The Europlanet 2024 Research Infrastructure (RI) provides free access to the world's largest collection of planetary simulation and analysis facilities. The project is funded through the European Commission’s Horizon 2020 programme and runs for four years from February 2020 until January 2024. The Transnational Access (TA) programme supports all travel and local accommodation costs for European and international researchers to visit 24 laboratory facilities and 5 Planetary Field Analogue sites (PFA). As part of the education and inspiration tasks associated with Europlanet 2024 RI, we have produced classroom resources aimed at age 10-14 year olds relating the conditions found within the PFA sites to astrobiology and the habitability of Mars. Each of these resources has been produced with ease of translation in mind, to be disseminated in other countries. This includes an increased presence of visual learning through these resources; such as narration-free videos with a template script which can be used in translation, and illustrated analogues based around the planeto astronomic concepts. These resources have been produced around all PFA sites: Rio Tinto River (Spain) Iceland Field Sites (Iceland) Danakil Depression (Ethiopia) Kangerlussuaq Field Site (Greenland) Makgadikgadi Salt Pans (Botswana) Puna Plateau (The Argentinian Andes) These resources link in with common areas found in worldwide STEM curriculums, such as volcanism, pressure, pH and evaporation. To achieve this, we have filmed lab-based demonstrations and included them in a classroom lesson plan alongside teachers’ notes. In addition, each lesson plan focuses on how the conditions of the PFA’s could affect the habitability of Mars. Following studies such as Salimpour et al 2020, highlighting the extent to which astronomy has been incorporated into school curriculums, we have chosen to highlight three subject areas with lower representation in high schools into our resources: physics, space exploration and astrobiology. As these analogue sites can be linked to more planetary bodies than just Mars, our next steps are to create similar resources based around the habitability of the icy moons of the Solar System.

Poster Leonard Burtcher Hannah Dalgleish, Victoria Grinberg, Violette Impellizzeri, Gina Maffey, Jacob White

Astronomers for Planet Earth: how a grass-roots organisation is helping astronomers address the climate crisis

This presentation will address the potential of astronomy outreach in communicating the urgency of the climate crisis. While astronomy and climate science are distinct fields, climate communication can profit from astronomy’s reach as well as from the public trust of, and fascination with, astronomy. Communicating the climate crisis to the public was one of the main motivators behind the creation of Astronomers for Planet Earth (A4E), https://www.astronomersforplanet.earth, who have been at the forefront of linking climate and astronomy outreach for nearly two years. A4E is a world-wide grass-roots movement uniting more than 800 past and present astronomy students, educators, and scientists around the globe to share their astronomical perspective about the Earth and climate change with the public. In this talk, we will show how, at A4E, we are engaging with astronomers all around the world to include climate change in outreach initiatives, both in dedicated talks about the "pale blue dot" and -- possibly even more powerfully -- as an add-on to other science topics from exoplanets to cosmology. We will discuss how successful this "astro-climate" outreach is, and where there is room for improvement. As A4E members are distributed across approximately forty countries on all continents, we will also provide an overview of how we have overcome such geographic and cultural challenges, and are engaging astronomers in climate action in different international contexts.

Poster Vanshree Bhalotia

Dancing with the Stars & Twinkling through the Clouds: interdisciplinary interventions in communicating astronomy

In recent years, exciting interdisciplinary approaches to astronomy communication have emerged and been implemented. However, the overall state of the field continues to cater to audience members with high levels of STEM self-efficacy, as seen through statistics on digital astronomy communication platforms, or at in-person outreach events. Education research shows that interdisciplinary approaches to communicating astronomy have a radical impact in increasing STEM self-efficacy and solidifying a scientist identity. Open dialogue between fields, such as astronomy and art/culture, showcase hyphenated identities in STEM and encourage unconventional methods of engaging with science. In my talk I will discuss the learnings from two interdisciplinary science communication efforts I have pioneered called "Dancing with the Stars" and "Stars on the Ceiling. "Dancing with the Stars" is a workshop suitable for all ages and accessibility levels, and uses embodied learning in conjunction with creative dance to communicate stellar and galactic dynamics. "Stars on the Ceiling" is a radio show I host, in which I initiate a dialog with artists and get detailed perspectives on works from their collections, and use it as a vehicle for communicating an astrophysical perspective to the public.

Poster Priya Hasan S N Hasan

The Good, Bad and Ugly Astronomy in Movies and Media

Movies and media have a very wide reach. Unfortunately, often they promote pseudoscience and wrong concepts in people. Often, seeing it in printed work or on screen people tend to accept it. Using movies and social media posts we trained people to critically assess the good, bad and science in movies and media to promote rational thinking and scientific reaseoning in people. We shall discuss our experiences with sessions with screening of movies like Gravity, Interstellar, Contact and Indian sci-fi movies in popular cinema. The screening was followed by discussions and careful assessment of science demonstrated. This is thus a very effective tool to communicate science to people.
Poster Mugdha Sinha Joshi Yogeshkumar Dileepkumar
"Astro-Night Sky Tourism Initiative" at The Heritage and Monumental Sites of Rajasthan for Astronomy Popularization

Department of Science & Technology, Government of Rajasthan has come up with an initiative of "Astro-Night Sky Tourism" at the Heritage and Monumental Sites of Rajasthan for Popularization of Astronomy based Tourism. This has been done in collaboration with the Department of Art and Culture, Government of Rajasthan, to bring science from the silos of labs to public, to generate both awareness and interest in science among students and citizens, by hands on activities in a multidisciplinary manner, as part of citizen science initiative. The Objective is to generate interest in astronomy by using the telescope to show case the cosmic activities in the night sky to Tourists, Visitors and Citizens once in a month by rotating the activity at various Heritage Monuments where they can watch the Planets, Stars, Meteors, Comets nearby galaxies, and many more cosmic activities free of cost. Every month, a new tourist destination is chosen for the Telescope Setup and advance intimation through banners, newspaper advertisements and social media is used to make an outreach to people. Voluntary Astronomy Clubs and Photographers who specialize in astro-night sky photography have also been roped for allied hands on activities.

Poster Yonggi Kim
Public outreach programs at Chungbuk National University

Some efforts of the Chungbuk National University, Korea, for public outreach will be presented. The Chungbuk National University Observatory opened the Jincheon station with a 1.0m optical telescope and 0.6m optical telescope, which we are using for researching and educating the students. We organized a astro family camping since 2014, where parents and children have a opportunity to overnight in camping place of our observatory, and to take part in interesting astronomy courses. Our program includes observation with small telescopes, visiting the research telescopes as well as many interesting astronomy games and activities. We also developed HTE STEAM programs for formal and informal education of students. Our department opened also the graduate courses for public astronomy in 2008. Over 100 students are working in public astronomical observatories, science museum and private astronomical education centers after graduating our course. In this talk, our experiences of communicating astronomy with public are summarized and our future work and plan will be reported.

Poster Harufumi TAMAZAWA Yuko IKKATAI
On-line Confrontational Science Cafe about Space Policy

Science cafes in Japan often become more lecture-based than discussion-based, and questions and answers are between the speaker and participants. There are many popular contents in astronomy and space science, which have many fans. However, there are also many highly specialized contents, which makes it difficult for the public to deepen the discussion. We have been developing a "confrontational science cafe" in sociology and policy about astronomy and space science since 2019 (Tamazawa & Ikkatai 2021 in press). This cafe clearly shows the axis of discussion, and two speakers argue their opinions from a bipolar different standpoint. In 2020, the pandemic of covid-19 forced us to be implemented online. There are various points to discuss for one theme. But by clarifying one axis of the theme, participants can easily build their own opinions, such as clarifying detailed conditions, and presenting new ideas. In addition, we can see the characteristics peculiar to online cafe, such as the ease of discussing in small groups, and sharing the distribution of opinions immediately with the participants by using the online voting function.

Poster Alice Hopkinson
Bringing astronomy to life with animation

Video animation can illuminate astronomical ideas. By navigating viewers through complex topics in a captivating way, the best short-form videos are both educational and entertaining. In particular, short animations and graphic design are tools to make the universe universal, appealing to a wide range of audiences. A clear animation can communicate a complex idea more succinctly and to a wider audience, than a textual description. These short-form animations are powerful when 3D viewers stand alone, but can also be highly useful in conjunction with other activities and resources as an explainer, and this is particularly relevant during this time of increased home learning. As someone with background of physics and astronomy yet keen interest in art and design, the work I do aims to combine both interests for effective communication of astronomy concepts. Through examples of the work I have done in my role at Las Cumbres Observatory, in this talk I will discuss the processes and techniques I’ve found useful in producing astronomy related animations without a formal background in art and animation.

Poster Kirsten Gottschalk Miriam Sullivan
Perth Astrofest: A high impact astronomy festival

Perth Astrofest is the largest astronomy event in Western Australia, and is a key focus for the local astronomy community each year. Since the first event in 2009 for the International Year of Astronomy, Astrofest has been held annually since 2011, and routinely attracts over 4,000 attendees, mostly from the surrounding Perth area. Astrofest is in initiative of the Astronomy WA collective, a non-incorporated body with representatives from the majority of Astronomy research, amateur, outreach, tourism and education organisations in Western Australia. Core funding to hold Astrofest each year comes from a group of key partners (Curtin University, the International Centre for Radio Astronomy Research (ICRAR), Sctech and CSIRO) with other sponsorship (both cash and in-kind contributions) coming from a wide variety of separate parties. We surveyed Astrofest attendees each year from 2014-2020, totaling 3045 respondents. About 40% of respondents had a background in science, and 44% said they were already interested in astronomy before attending. Astrofest appears to improve attitudes toward astronomy. Respondents strongly agreed that Astrofest made them feel more inspired and confident about astronomy, and only 0.8% of respondents said they were less interested in astronomy after attending. Most respondents planned to follow-up Astrofest with other astronomy-related activities, particularly visiting an observatory, talking to others about the night sky or researching astronomy online. We will discuss the most popular elements of the event and the impacts on the audience’s attitudes and intended behaviours. In particular, we will focus on the differences in impact between respondents who were already interested in astronomy before attending, and those who were not. Lessons from Astrofest can inform your next large-scale astronomy event, including the ways events can add value to the broader astronomy community and the event elements that are the most engaging for different audiences.
Astronomy for Equity will use the proven ability of astronomy to promote, support, and create STEM (Science, Technology, Engineering, Math) education programs that encourage students and others in marginalized and isolated communities historically lacking representation and opportunities in STEM fields. Students in particular are often discouraged by the lack of opportunities, role models, and support from teachers, creating a self-perpetuating cycle requiring intervention. Astronomy programs touch on all STEM fields, are available in all communities including those with limited educational resources, and are of great interest to students, teachers, and the public than other STEM fields. However, successful programs are often ad hoc and temporary, lacking broad distribution of resources that are produced and lacking follow-up programs to build on the initial investments. Astronomy for Equity will address three types of programs: 1) Support the sustainability and expansion of existing programs by providing resources, including expertise, awareness, and international support, 2) Create new programs based on existing networks, communities, and programs through new collaboration for both logistics and transdisciplinary support and ideas, and 3) Disseminate resources and expertise to the robust worldwide astronomy community. All programs are based on existing resources reimagined and deployed in new ways. To further these global goals, Astronomy for Equity will also foster the shift in perspective experienced by astronauts where Earth is recognized as humanity’s common home. Advancing global programs requires an understanding of, and sympathy for, each other as fellow travelers on Spaceship Earth. The Pale Blue Dot image from Voyager 1, the Earthrise image from Apollo 11, and the Blue Marble image from Apollo 17 are examples humanity’s glimpse of Earth from beyond its surface that have affected our view. The landing of Apollo 11 on the Moon was embraced as an accomplishment of all humanity, a first step into our cosmic neighborhood. Working with author Frank White—who coined the term the Overview Effect and first described it in his book of the same name—and other members of the Overview Institute, astronomers, and the worldwide astronomy community, the Overview Effect can be brought down to Earth. Astronomy is the Overview Effect for the rest of us who won’t make it into space. Astronomers recognize that we ARE in space, together, and that we truly “are all in this together.” Existing networks and newly created multidisciplinary networks will be utilized to bring multiple perspectives to new programs, reaching new audiences through astronomy and space exploration. Addressing inequity that originates in a lack of diversity can only be addressed through greater diversity, crossing borders of all kinds. Diversity is the key to unifying to address our interrelated global issues. Astronomy holds the key to making it happen in a truly universal way.

Unmasked: the science of superheroes

"Unmasked: The Science of Superheroes" (USoS, ISBN 978-1912979080) is a multidisciplinary, not-for-profit science engagement project based around a popular science book authored by seven researchers (four female, three male) at the University of Central Lancashire, UK. Aimed at the early teenage market, USoS seeks to explore the scientific realities behind famous comic book legends and blockbuster movie icons. Launched on World Book Day in February 2020, USoS draws on Astrophysics alongside Computing, Engineering, Mathematics, Biology and Psychology to examine how real-world research can be just as wondrous and intriguing as the exploits of events presented on our cinema screens. In the book, the authors present their projects in small sections, with their characters reflecting different types of superpowers and their scientific basis. The astrophysics chapter (authored by Walsh) is entitled "Alien Worlds" and examines the Drake Equation, the search for exoplanets and possible interstellar travel. During 2020, schools’ outreach events were planned to coincide with the publication in addition to an extensive engagement programme at science, literary and comic festivals. This included author talks/demos, reading sessions and panel discussions; however, the COVID-19 pandemic halted all this activity. Instead, the authors sought other avenues for engagement. In particular, the UK Science and Technology Facilities Council saw the opportunity for a unique approach to book and the USoS team; so much so that STFC invested almost GBP23,000 in the printing of 12,000 copies to be used for their national science engagement activities. Subsequently, in collaboration with the Reading Agency (readingagency.org.uk), over 5000 copies of USoS have been placed in nearly 3000 local libraries across the country as a way of way of getting children interested in STEM subjects through reading. The team also worked with STEAM Packs, a local children’s charity. Knowing from their own experience that life in hospital can sometimes be “boring, painful and a little scary”, STEAM Packs distribute educational science, technology, engineering, art and maths packs to chronically sick children in hospital. By late 2020, over 700 books went to specialist play units in children’s orthopaedic units and cancer wards across England. This talk will outline the lessons learnt from bringing together a truly multi-disciplinary project as well as explore the use of popular culture to frame science engagement interventions. The opportunity to reach new audiences at such diverse non-traditional venues as literary festivals and comic-cons will be examined as well as how projects like this can reach underserved young people via libraries and hospital wards. USoS is available to purchase online (current Amazon rating = 4.8/5) with any profits retained within the project itself. The project website is www.unmaskedscience.com.

Using beliefs and misconceptions in astronomy to train critical thinking skills

If these days of post-truth, fake news, and conspiracy theories, citizens may find it difficult to give credit to science and to trust media or even scientists. Then, they develop their own beliefs and misconceptions that interfere with knowledge acquisition. It is not a matter of science literacy: even educated people—and the scientists themselves!—may be fooled by their certitudes and cognitive biases, and eventually think wrong. For that matter, astronomy makes no exception. However, astronomy provides some advantages to train critical thinking: there is a strong consensus on very well established knowledge and most astronomical subjects are hot topics so they may be used to start calm discussions instead of impassioned and sterile debates. Besides, astronomy speaks to everyone, even the youngest and even the least educated. In this presentation, we shall show how to use simple concepts (the shape of the Earth for instance) to help the public gain confidence in science. This is achieved by several means. First, we have to explain how science works, how the body of knowledge is built; in other words: how we know what we know. Then, it is also essential to work on media and education literacy: how information is produced and delivered, and by whom. Last, we need to raise awareness about how the brain works and about cognitive biases. In the end, the ultimate goal is to help the public become enlightened citizens with good critical thinking skills.

Can a popular science journal written by professional and amateur astronomers survive in the era of social networks? The example of the French magazine L’Astronomie

L’Astronomie is a popular science monthly journal edited by the Société Astronomique de France (SAF). It is edited by a team of volunteers composed of professional astronomers and amateur astronomers. The team also comprises a wage-earning computer graphic designer, and a proofreader. Since 2008, L’Astronomie has circulated by subscription and at kiosks. This period of time corresponds to a general crisis of the written press. And during the last ten years, many popular science magazines have shut down or merged with other magazines. Three popular astronomy journals are published in France today. Among science magazines, Astronomy is surviving rather well. The reasons why it resists may be its editorial policy, volunteering, and the counterparts of the magazine on the web and on social networks.
Gravitational waves represent a fundamentally new type of astronomy and a large shift away from the stunning visuals offered by traditional telescope based observations. Such shifts, require innovative new ways of communicating their science outputs to the public. We present Chirp, a mobile and web app that distills data into key statistics and data-driven visualisations, produced in low latency from gravitational wave events. The app has been written by volunteers from within and outside the LIGO Scientific Consortium. Chirp, capitalises on the speed of communication offered by social media and mobile-push-notifications, to create excitement around transient events in the sky. Data is released to the public within minutes of a gravitational wave detection via the GCN Notice system. The Chirp app listens to this data stream in real-time and filters out gravitational wave events, catches these notices and logs them into a database. This triggers an alert, sent out via Push Notification to the user base, informing them of the detection. In addition, a tweet is formatted and published on @LIGO’s Twitter stream. The Chirp apps accessibly present key information—such as the false alarm rate, the distance range likely to contain the event, and the most likely source of the event—alongside 3D renders of the probability distributions for events, providing a tangible, visual element for non-experts to understand. The mobile app maintains a wide user base, including enthusiasts, hobbyists and scientists alike. Of these, around 9,000 are regular users and are subscribed to push notifications. The web-app also maintains a large audience, drawing in some 4,000 unique visitors per day during observing runs. With the pandemic, our apps have also been used to deliver skymap visualisations in place of in-person exhibits at science festivals. We plan to use it for this purpose at a virtual science conference in Italy this September. Based on our initial success, we are working on improvements to increase user engagement and link resources for teachers and further individual study. The Chirp app is delivered as part of the LaserLabs suite of educational games, developed by active gravitational wave researchers.

SUN is a collaboration between Prof. Robert Walsh and artist Alex Rinsler, in partnership with the UK Science and Technology Facilities Council. The art/science installation is a floating spherical light artwork, 7 metres across, presenting actual astrophysical data from NASA’s Solar Dynamic Observatory in stunning 360°, with additional smoke effects to mimic the Sun’s corona. SUN displays 10 weeks in the life of our closest star in 12.5 minutes of real time and is designed to be a spectacular cultural centrepiece. The continually revolving imagery reveals the Sun in extreme ultraviolet, a part of the electromagnetic spectrum beyond human sight, with the ethereal atmosphere completed by an original soundscape. Cycling through different ranges of temperature from a cool 4500 degrees to an impossibly hot 10 million degrees, SUN reveals our star in a completely new light. Images of SUN can be found at the website www.seethesun.org. SUN was conceived in 2017 and piloted at the Lightpool Festival in Blackpool and at Light Up Lancaster in Autumn 2019 with more than 10,000 visitors. SUN is now financially supported until 2023 by a national strategic partnership between STFC and the University of Central Lancashire. This presentation will outline the process of how an artist and an astronomer can collaborate to instigate, plan, fund, build, present and evaluate a project such as SUN. The piece is unique from both the perspectives of contemporary art and science engagement. From an artistic point of view, SUN is the first solar projection of this size to attempt to conceal the projections sources within the sphere, and to deploy programmed smoke effects to faithfully mimic the Sun’s outer corona. It has the “wow” factor! Complementary to this, the team works with the host venue to deliver a targeted programme of science engagement depending on local needs and opportunities. This includes astronomers interacting one-to-one with visitors as they view SUN; associated on-site school science/art workshops; astronomy information stands and relevant exhibits around the installation itself; an 8-minute video presentation “From the Earth to the Sun” that has been sign language interpreted as well as public lectures/panel discussions on astronomy topics. A SUN augmented reality app also allows the user to visualise walking through the Sun’s 3D magnetic field as it streams outwards. With a wide audience demographic, visitor dwell times of up to 45 minutes and three-quarters of those surveyed indicating they had learnt something new about astronomy, the physical manifestation of real astronomical data for an object that everyone is familiar is inspirational and engaging. The talk will examine how this approach to art/astronomy engagement can enhance science discovery, artist expression as well as the wider public understanding of both. Outline plans for bringing SUN to a significantly diverse range of venues across the world will also be discussed.

Environmental education through astronomy

Environmental education through astronomy. R.Tsolmon, B.Altangerel, 1,3 National University of Mongolia, School of Arts and Sciences 2 National University of Commerce and Business, Mongolia. This paper will share on “Environmental education through astronomy in some regions in Mongolia. Astronomical outreach activities have been done in both big cities and remote areas for environmental protection. Human induced activities have had a significant impact on the big city, resulting in light pollution and air pollution. Climate change in vast remote areas causes desertification and dust storms due to mining activities. The dark clear sky is the nature of the vast area for all time. There is a need to develop environmental education and protect the dark clear sky in these regions. Light pollution in big cities and dust storms in remote areas are being a big environmental issue nowadays. It is necessary to develop environmental education in such areas. Astronomical outreach and art cultural activities are good tools for environmental protection. Amateur astronomers and school teachers started outreach activities for the Environmental protection and importance of having clear beautiful dark sky in summer 2020. For this activity they started star parties so that participants can observe stars and moons by naked eyes and telescope and inspire beautiful clear sky in their region. Public and kids had the opportunity to see stars in the night sky in the big city. School teachers and amateur astronomers provided guidance on intelligent lighting for mining companies, enjoyment and inspiration of the night sky, and understanding of the impacts of light pollution on nature. Public was aware that light pollution free cities and dust storm free remote regions are important and environmentally beneficial. School teachers and amateur astronomers jointly discussed future activity plans by making new inputs such as “Protection clear sky is part of environmental protection” in their region. Astronomical outreach is useful for environmental education and protection.
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<th>Poster</th>
<th>Emma Zulaiha Zulkifli</th>
<th>Online platform for astronomical observation for Malaysian during Movement Control Order in Malaysia</th>
<th>The Malaysian government has imposing Movement Restriction Order to restrain the Sars Cov-19 from spreading. Due to restriction movement order, no physical events to be held nor gathering at any place or anytime in the time of pandemic still going on. This paper is to discuss the method to conduct astronomy events during the pandemic Sars Cov-19 by a non-governmental body through a virtual platform. Specifically, for astronomical events such as annual meteor shower and great conjunction to be held for the whole country. During the long-term staying at home, more people tend to browse media social, especially at night. Thus, it is the best time to have an astronomical observation live through media social collaborated with local stargazers around the country and with their camera towards the sky. To have more feedbacks from the viewers, a platform for viewers to share their image is opened gaining more than 100 images in an hour. The results showed that citizens are excited to look at the night sky even virtually with the collaboration of local stargazers to share their sky. These results suggest that having a platform for citizens to watch astronomical events and to share their image when there’s movement control order is one way of holding an event. On this basis, the potential method in the future with collaboration with the international stargazers or astronomy clubs to share their sky.</th>
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<td>Poster</td>
<td>José A. Caballero</td>
<td>Rock and astronomy under one sky, an IAU100 special project</td>
<td>For its 100th anniversary in 2019, the International Astronomical Union selected 22 special projects worldwide. &quot;Rock and astronomy under one sky&quot; (Rock y astronomia bajo el cielo) was one of them. On the night of 10 May 2019, in the esplanade in front of the Planetario de Madrid, we organised an astro-musical event, free and for all audiences. &quot;Rock and astronomy under one sky&quot; consisted of an outreach talk accompanied by music, entitled &quot;From Mozart to Lagartija Nick, through Bowie and Vangelis: a musical voyage to Astronomy&quot;; official presentations by the sponsors and organisers; and a concert by professional rock musicians in famous Spanish indie bands (Lagartija Nick, Lori Meyers). The artists played only themes connected to astronomy and space sciences with lyrics in Spanish and English, mostly composed by them (including a new theme dedicated to IAU100), but there were also covers. During the concert, we projected videos and images related to the music themes on the Planetario dome, while on the other side of the esplanade, the public could also look with portable telescopes at the setting Moon and planets, stars and bright deep sky objects. The legacy video is available at <a href="https://www.youtube.com/watch?v=2HAFRmATRw">https://www.youtube.com/watch?v=2HAFRmATRw</a></td>
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<td>Poster</td>
<td>Sagar Golkhale</td>
<td>Nationwide experiment to estimate size of earth using Eratosthenes’s method</td>
<td>Jyotirvidya Parisanstha (popularly known as JVP to astronomers in India) is India’s oldest Amateur Astronomy Association, established on August 22, 1944 (<a href="http://www.jvp.org.in">www.jvp.org.in</a>). It carries out various activities like star parties, basic astronomy courses, study tours, exhibitions, lectures, side walk astronomy; as well as coordinated observations across India with an aim to popularize astronomy and inculcate scientific thinking. JVP also is a coordinator for IOTA for India Chapter and also is the contributor to AAVSO for highest number of observations of DSLR Photometry. Many school and college level students are engaged in amateur astronomy activities in JVP and looking forward to carry on these activities and scaling them up to a global effort. Vigyan Prasar (literally meaning &quot;Science Popularization&quot;) is an autonomous organization under the Department of Science and Technology (DST), Government of India. It has formed a network of science clubs across India which is known as &quot;Vigyan Prasar Network of Science Clubs&quot; (VIPNET) (<a href="https://vigyanprasar.gov.in/vipnet/">https://vigyanprasar.gov.in/vipnet/</a>). Many of the clubs in this network are school science clubs. JVP is also part of VIPNET and carry out few activities related to astronomy in collaboration with VIPNET. Eratosthenes’s experiment to find earth’s circumference is a well-known experiment and considered as first experiment which estimated size of earth with more than 90% accuracy. This experiment is quite simple and requires very simple apparatus. Jyotirvidya Parisanstha along with Vigyan Prasar thought that this simple experiment can be repeated easily at home by VIPNET clubs in the lockdown period because of COVID-19 pandemic. Around 80 VIPNET clubs across India responded to this idea and participated in the experiment. The date for the experiment chosen was 13 May 2020 which was zero shadow day at Pune (location of Jyotirvidya Parisanstha). Thus concept of zero shadow day and apparent motions of sun was also introduced to participants and clubs in tropical region can henceforth celebrate the zero shadow day for their location. At different observing locations on same day, participants measured angle of sun from their zenith at local noon using a simple gnomon setup. Although all the locations of observers and Pune are not on same longitude, only latitude vector of the distance between the observer’s location and Pune was considered in calculations. The results obtained from all the observers were then collected, calculated and compared. Total 84 observations were recorded across the India. The average of the circumference of the earth thus calculated from the observations recorded by different observers was 96% correct. This nationwide event was coordinated through video conferencing. The participants were school teachers and students who did the experiment from their home during the lockdown. They learnt how to make the simple setups using things at home to take astronomical observations and simple calculations to learn basic concepts.</td>
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| Poster | Thierry Botti | Networking to communicate widely astronomy with the public | As a research center in astronomy, we benefit from a largely favorable context to communicate about astronomy even without an important budget. Astronomy is a fascinating science for the public and we are the actors at the forefront of this scientific field, building on a daily basis this science and the means to make it progress. In this context to communicate and set up outreach programs, let’s use this rich potential and this favorable context to build a network of partners to contribute to - Disseminate our messages widely on a territory - Broaden the scope of audiences reached - Attract new partners far of our scientific field This talk will be an fascinating science for the public and we are the actors at the forefront of this scientific field, building on a daily basis this science and the means to make it progress. 

For its 100th anniversary in 2019, the International Astronomical Union selected 22 special projects worldwide. "Rock and astronomy under one sky" (Rock y astronomia bajo el cielo) was one of them. On the night of 10 May 2019, in the esplanade in front of the Planetario de Madrid, we organised an astro-musical event, free and for all audiences. "Rock and astronomy under one sky" consisted of an outreach talk accompanied by music, entitled "From Mozart to Lagartija Nick, through Bowie and Vangelis: a musical voyage to Astronomy"; official presentations by the sponsors and organisers; and a concert by professional rock musicians in famous Spanish indie bands (Lagartija Nick, Lori Meyers). The artists played only themes connected to astronomy and space sciences with lyrics in Spanish and English, mostly composed by them (including a new theme dedicated to IAU100), but there were also covers. During the concert, we projected videos and images related to the music themes on the Planetario dome, while on the other side of the esplanade, the public could also look with portable telescopes at the setting Moon and planets, stars and bright deep sky objects. The legacy video is available at https://www.youtube.com/watch?v=2HAFRmATRw |
"Allande Stars" is a project that aims to share Science and Astronomy in Allande, a rural area of Asturias in North Spain, that is quite isolated and has very little access to science outreach on cultural programs. The initiative was conceived to be inclusive and intergenerational, so everyone in the villages, from little children to elders, could enjoy them. Also it was specially designed to adapt to the health and safety restrictions posed by the COVID-19 pandemic and served to create protocols to be applied by this type of initiatives in other regions. In fact, the local community were actively engaged in the organization and participation in the project, and have committed to provide long-term support. Thanks to the inertia given by the project, the Allande town hall is currently developing a astro tourism program which involves obtaining the international "Starlight Certification" as a dark-sky site ideal for stargazing activities and committed to the preservation of the local patrimony. The activities of the project consisted of inspired talks and workshops about the dimensions of the Universe and our place in it, from the Pale Blue Dot perspective, having the local heritage, culture and landscape as a starting point. Night sky observations, together with storytelling of legends from Allande, also took place in different locations across the region. In order to assess and measure the impact of the project, semi-structured questionnaires and interviews with participants were carried out. The collected answers were analyzed with the Discourse of the Collective Subject, a methodology which allows to analyze this kind of data both in a quantitative and qualitative manner. The results revealed that participation in the Allande Stars project helped to stimulate the life in the villages, to motivate young people and engage them in the community, allowing families to learn together about the Universe. It also raised awareness about the importance of preserving and enjoying the high-quality night sky of the region. Having female scientists as speakers was regarded as extremely relevant too, in order to provide role models for children and youngsters.
The dissemination and raising an awareness on astronomy in Thai society” is one of the missions of National Astronomical Research Institute of Thailand (NARIIT) and the inclusions are also one of the target groups of NARIIT astronomy outreach for Thai society. NARIIT started its astronomy outreach for inclusions in 2016 with the learning media development for visual-impaired students (Tactile constellation models) and followed by some astronomy activities for neurodiversity, such as the workshop for autistic students. NARIIT-IAU100 Inspiring Stars (IAU100 Inspiring Stars Thailand) is the other milestone of NARIIT astronomy outreach for inclusions in June 2019 with the support from IAU Office for Astronomy Outreach (OAO) and National Astronomical Observatory of Japan (NAOJ). This event provides the foundation of NARIIT astronomy outreach for hearing-impaired, include the first planetarium show for deaf students in NARIIT headquarters in February 2020. The author will present and discuss about the result activities from IAU100 Inspiring Thailand, development and future plan of NARIIT astronomy outreach for inclusions in this oral presentation. For examples, The suggestions on student project about tactile planet models, The design of astronomy words in Thai sign language, Astronomy teacher training for science teachers in the schools for hearing-impaired.

Rectifying “biscuit bite” and other misrepresentations of the Moon

The Moon is a common celestial body, finding itself used frequently in popular art. In fact these days we may see the moon more in representations on paper or on a screen, rather than in the sky! In that case we either see it in a few scientifically accurate diagrams and simulations such as those made by NASA / ESA or we see a gamut of “artistic freedom” using the Moon in whatever way that comes to mind without any consideration to reality. This basically leads to extreme penetrations of wrong concepts in people eg. the Moon comes up when the Sun sets (even from the same place)! Since in today’s post factual culture, it is assumed that we know everything about the Moon since men walked on it, even simply looking at the Moon is not common. There are efforts to address this lack of observations by our community with sky watching sessions or events like Observe the Moon Night. However, the misrepresentations of the phases of the Moon probably needs a more extended set of observations. Since this is not so common, these are very prevalent and are difficult to eradicate. Unfortunately, the lack of actually having seen the Moon change becomes embarrassingly evident in activities developed to teach about the Moon’s phases! The “Biscuit Bite” is one such seemingly fun but grossly erroneous example. Another example is passing off the “phases” of a Solar eclipse as that of the lunar cycle, just because the former also features a reducing crescent. We wish to informally point out some of the common errors, present a few fixes and point to an activity that may be useful to rectify this. The #AstroAtHome “Moon Challenge” was a month long activity carried out in April-May, 2020 in order to keep people connected to the sky during the Lockdown, carried out by IUCAA Scipop. Participants had an easy (seemingly) task of taking a look at the Moon at least once every day, over one complete lunar cycle of phases i.e. from one new moon to the next. We also participated in this at the same time, sharing videos daily about our own experience, and to give more information about the Moon and related occurrences in the sky. Several amateur astronomers also joined in by sending their own pictures during this period which were an excellent value addition to the effort. The video playlist is linked here - https://youtube.com/playlist?list=PLZQ-f4rer2gvBKcV48idzLLk0DG3zZ7kS We feel that the Astronomy outreach community can do similar challenges to get people more acquainted with the Lunar phases among other things, and even get them to think about how unscientific concepts are common and how we just accept them.

Being an Astropreneur: Future Trends of Interdisciplinary Approaches on Astronomy Education and Outreach

This oral presentation explores the reframing of future abilities and promotional strategies that would be crucial to Astronomy educators and advocates, in response to the changes in popular science promotion caused by the COVID-19 pandemic. Through interdisciplinary approaches, promoting Astronomy will not only organize traditionally observational events and workshops, but there is also a pressing need to learn future abilities with new motivational strategies to be adaptive to unexpected incidents. Through Transmedia innovation, integrating science and arts could be an effective method to redefines our understanding and methodology of Astronomy education, from reconstructing inspiring mindsets to building a shared-valued community without borders. It could also contribute effectively to interactive teaching and design thinking for solving real-life problems related to Astronomy.

During my studies in astronomy in Poland - Ożarów. I conduct numerous charity lectures for children, sky observations, interactive shows and professional astronomical research with my own equipment. I work a lot for science. In 2020, I was at the forefront of observers of the C/2020 F3 NEOWISE comet, making a lot of scientific observations, and in 2018, together with G. Murawski, I managed to discover an unusual variable star named: TYC 2836-1816-1 with the RS type. Period: 35.51 days. In my life, I had the honor of meeting the former head of NASA - Steve Jurczyk, or Mr. Robert Zubrin from the colonization of Mars. I am very grateful to him for his help in this discovery. For my achievements, I was honored with the title of finalist in the prestigious Polish competition “Student Nobel Prize 2019” organized by the Polish Ministry of Science and Higher Education in May 2019. In my short speech, I briefly summarize what I do on a daily basis and what I have accomplished when I was only 23 years old. Astronomy will stay with me for the rest of my life. I cordially invite you.

The Bachelor of Natural Sciences of the Faculty of Education of the University of La Sabana, along with the local mayors of Tenjo and Tocancipá, organized Astronomy Festivals in 2019 to bring science to the inhabitants of these municipalities. Before carrying out the activities for the festival, the teamwork organized five meetings to ultimate logistic details. Additionally, other participating institutions, such as ACDA, GCPA-UNAL, and SIEMENS Latin America, helped with it. Activities include 1) workshops to measure Earth’s curvature, 2) differences between solar and moon eclipses, 3) use of telescopes, and 4) identification of geological structures on the surface of the Moon. Around 5500 people from the rural and urban areas of both municipalities participated in these Astronomy Festivals.
Under the Same Eclipse - A global project to observe the longest total lunar eclipse of the century on 27.07.2018 from Sri Lanka and Cyprus Madura COORAY, Ashan ARiyAWAaNSA, Marja SEIDel, Natalie CHRISTOPHER, Francesca FRAGKOUDI, Dhamith WEERASINGHE, Sanjula THIRANJAYA, Eranga AMARASINGHE, Sachitha DULANGA, Asanka RAJAPAKSE, Asela ATTYGALA Abstract: The project "Under the Same Eclipse" took place over several months in spring and summer 2018 in Sri Lanka and Cyprus. The highlight was the longest total Lunar Eclipse of the century - observed, measured, and shared by almost 1500 students in Sri Lanka and Cyprus on July 27. There were three groups that observed it in Sri Lanka, from Colombo in the West, Tangalle in the South and Lahugala in the East. Another group, in a bi-communal effort between both Greek- and Turkish-Cypriots, was observing it from Sipahi/Ayia Trias in the Karpasia Peninsula in Cyprus. This was a unique scientific and cultural global endeavor for both the students and the organizers who were able to observe and measure an astronomical phenomenon while fostering a sense of global citizenship and realizing our place in the universe.

Astrofísicos en Acción: astronomy outreach for Latin America in the new digital era.

Astrofísicos en Acción is an astronomy outreach project formed by graduates of the Postgraduate Program in Astrophysics at UNAM, in Mexico, as well as some other collaborators. Our aim is to spread astronomy to the Spanish-speaking general public through social networks, workshops, conferences and astronomical observations, always in an entertaining, interactive and fun way. Currently we have ~ 170 thousand followers worldwide accounting for all our social networks, and this number grows every day. We have developed strategies that allow us to publish interesting and innovative content constantly, which has been reflected in a fairly high audience engagement. Thanks to the high interaction with our public we have managed to reach communities with economic, cultural and educational problems in different ways, participating in science festivals and taking our content to schools of all socioeconomic and academic levels. Moreover, we collaborate with artists from different disciplines in order to expand the possibilities of science communication and expand the cultural offer. We have established links with different institutions and companies, including: Fondo de Cultura Económica, Editorial Planeta, Light Room Mexico, Telefónica Foundation, Bushnell, Zima Entertainment, Talent Land and YouTube.

Using the film festival model to inspire creative art-science and reach new audiences

Public engagement projects which see artists and scientists collaborate together in some way have become increasingly popular. Many art-science collaborations simply try to improve the ways science is communicated to the public, whereas art can also be used as means of trying to embed science more as part of culture. By working in partnership with film industry professionals, the SSFX (Space Sound Effects) Short Film Festival was devised to infiltrate space science into the independent film world with the aim of reaching new audiences, something which many art-science collaborations struggle to achieve. We discuss how the standard processes of international film festivals were adopted by the project to provide an authentic and attractive challenge to filmmakers – to produce creative short films inspired by and incorporating the sounds of space. Seven films covering a wide array of topics/genres (despite coming from the same sounds) were selected for screening at a special film festival. The works have subsequently been shown at numerous established film festivals and screenings internationally. These events have attracted diverse non-science audiences resulting in several unanticipated impacts upon them, thereby demonstrating how working with the art world can open up dialogues with both artists and audiences who would not ordinarily engage with science.

IAU 100 Celebration was an interesting year-long celebration with participation from more than 140 countries all around the globe. In Malaysia particularly, we also did not miss the opportunity in celebrating the IAU 100 in order to create more awareness and impactful programmes for the young generations. As part of the Co-NOC IAU for Malaysia, Apadilangit organised numbers of programmes that suites for as young as 3 years old until adult. We also conducted programmes for the inclusive communities with hearing and visually impaired students. Apadilangit through AstroInclusive programmes organised an introduction to astronomy and solar observation with them. The excitement for them is when they learn sign language related to astronomy and experience using telescope to observe the sun safely. Besides that, Apadilangit creates awareness for the public through Let’s Observe the Moon event monthly with the concept of astronomy on the street. Public gets the opportunity to observe the moon through a telescope and engage with Apadilangit team members to ask any question about astronomy. Apadilangit was also participating in the Under One Sky children drawing contest for the IAU100 Moon Landing 50 Celebration Global Project. Some of the drawings by Malaysian participants were also featured in the IAU Office for Astronomy Outreach social media. Furthermore, to excite things, Apadilangit and the National Planetarium with collaboration from the Ministry of Energy, Science, Technology, Environment and Climate Change Malaysia (MESTECC) and Co-NOC IAU Malaysia had organised the Name Exoworlds for national level in Malaysia. We received a lot of participation from school students. Lastly, Apadilangit also organised one of the Global Projects by the IAU 100 which is the Pale Blue Dot campaign for promoting Astronomy for Global Citizenship and Environmental Awareness through organising astronomy camp for primary school students at the National Planetarium. Throughout this 1 year of celebration, we believed that it was a great and important event by the International Astronomical Union (IAU) to expose to the public especially Malaysians about IAU organisation and the existence of Co-NOC IAU Malaysia.
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<th>Poster</th>
<th>Authors</th>
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<td>Poster Akihiko Tomita, Kazuya Ayani, Hitoshi Yamaoka, Mahdi Rokni, Hasan Baghbani</td>
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<td>Nowruz, the spring equinox day, is the new year day of Iran and surrounding regions from Africa to Asia. It is also mentioned by the United Nations, International Day of Nowruz. ITAU and SINA welcome teachers and students all around the world with open arms to celebrate this astronomical-cultural time to share the friendship and the spirit for peace. The participant schools and local community from Iran, Japan, Romania, and Bulgaria presented their own astronomical-cultural ceremonies and events. The Japanese team, including teachers and students, local community, and astronomy fans responded to the call. More than a thousand years ago, in the 8th century, when Japan had learned about Buddhism and other cultures and technology, many great persons from many countries, including Persia, helped Japan at that time. The ancient capital of Japan had a treasure house, and some of the great treasures were from Persia. The treasure, technology, and culture in Persia and many surrounding regions were conveyed through the Silk Road, the great road connecting the East and the West of the Eurasian continent. The next goal is to establish the 21st-century version of the great Silk Road with the spirit of Under One Sky, the IAU100 theme. The spring equinox astronomical-cultural online event can overcome the international severe situation and the physical distance issue due to the pandemic, contributing to a better world on the Pale but Shining Blue Dot, another IAU100 theme.</td>
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<td>Poster Durruty Jesús de Alba Martínez</td>
<td>Durruty Jesús de Alba Martínez</td>
<td>6 Years of History of Astronomy in Newspaper</td>
<td>On April 12, 2015 was published in El Diario NTR newspaper of Guadalajara, México the first “El pegaso de Sigüenza” editorial column, devoted mainly to History of Science issues (Physics and Astronomy), in this talk we are described how are selected and prepared the History of Astronomy issues and as well a brief biographical sketch of Carlos de Sigüenza y Góngora, XVII Century scholar from Mexico City that give his name to the column. Are showed some of the published articles both in paper and web form describing themes as persons, books, places and conferences approached.</td>
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<td>Poster Federico Di Giacomo</td>
<td>Federico Di Giacomo</td>
<td>Educational robotics with Arduino: a gravitational balance and a sky of LEDs to learn about the sky</td>
<td>Educational robotics can be traced back to the educational sciences that use information technologies to promote learning. Papert considers robotic technologies as “objects to think with”. In fact, these technologies make it possible to make abstract concepts concrete and manipulable, far from the experience of children and young people, increasing the possibilities of learning. Following the constructionist ideas and practices the National Institute for Astrophysics has developed Play, a web platform that collects various activities of coding, educational robotics, making, tinkering using astronomy and astrophysics as a tool to develop computational thinking and all the skills that are typical of scientific research in the STEM field. With this talk we want to present two projects created by the Play group. The first project aims to create, using an Arduino board and a series of buttons, a weight scale capable of measuring the weight that people and objects would have on the various planets of the Solar System. Thanks to this project it is possible both to know Arduino and to understand how much the weight depends on the planet you are on, but not only. In fact, by modifying the code, it is possible both to add other celestial objects, and to create a real contest in which students, knowing the weight of an object on Earth, will be able to “guess” which planet they are on. The second activity, Instead, aims to create and turn on one or more constellations using Arduino and some LEDs. In this way it will be possible to describe, through an active, cooperative and operational approach, what are the stars, the constellations and the close relationship that has linked man to the sky since the dawn of time. During this last period of lockdown, these activities were presented in virtual mode. The first activity was presented, at various schools, in a webinar during the European Code Week. While the second project was conceived and developed in virtual mode to show the beauty of the sky to children and teenagers, but not only, even in a period of closure in all our cities. These projects were created with Arduino, a platform with which it is possible to encourage creativity, allowing everyone to give shape and substance to their ideas because the only limit we can put is our imagination.</td>
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<td>Poster Sonal Throve, Samir Dhurde</td>
<td>Sonal Throve, Samir Dhurde</td>
<td>A Comprehensive Database to Build an Insightful Planetary System</td>
<td>Many topics in Astronomy and Astrophysics (A&amp;A) are included in the school syllabi of most of the countries across the world, including India. We have been conducting teachers’ training programmes to help them make science classrooms more interactive and insightful for children. In these programmes, we try to use low-cost, easily available regional resources to build models, demonstrations and perform experiments. In our recent training sessions, a model of planets scaled to their sizes became a hit. The reason was, we used material that can be found in almost every kitchen in India. We observed that, just like us, many educators across the world have been putting their imagination and efforts to collect the material available around them to explain the scales of solar system objects, especially planets. To appreciate these efforts taken by our fellow astronomy communicators, we aim to build a database by assembling the knowledge of different kinds of regionally available objects that can be used for this purpose. Our aim is to create a single platform where a willing astronomy communicator or a learner from any part of the world can find the objects that serve as scaled models for solar system planets. We wish to present our experiences of our insightful training programmes, our survey with astronomy communicators across the world and how this database can be useful to learners as well as educators worldwide.</td>
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The Night of the Stars (Noche de las Estrellas, NdE) is a program of the Mexican Academy of Science, whose main objective is to strengthen a scientific culture through Astronomy in all levels of the population. It merges the efforts of some of the most important Mexican institutions as well as the participation of telescope sellers and amateur astronomers across the country. The NdE was born in France where “La Nuit des Etoiles” is organized every year, since 1991, in more than 400 places. In Mexico, it started as a collaboration with the French embassy. This astronomical party has been organized with great success since the first edition in 2009 during the International Year of Astronomy. Each year, since then, NdE have had an increasing number of venues all around the country. Also, each year NdE have had international venues. During the NdE, only one day each year, about 200,000 people convene on these venues to enjoy the sky and science. Approximately 6,000 volunteers are needed to organize the activities offered: workshops, talks, stargazing, concerts, etc. More than 1,700 telescopes are available to the public, offer and operated mainly by amateur astronomers, either associated in a group or individually. We invite anyone who has a telescope to share it with the attending public. During the twelve editions, the NdE have convoked in total more than two million visitors distributed in the participant venues. This would be impossible without a large collaboration of amateur astronomy groups, astronomers and science popularizers who are very well organized in networks, such as the Mexican Association of Planetariums, the Association of Science Centers and Museums, the Science Popularizers Network, etc. NdE is coordinated through a National Committee (NC) composed of representatives of some of the major astronomical research and outreach institutions in Mexico. Up to date, the NdE network is composed of more than 100 venues, named “local committees”, distributed throughout the states of the Mexican Republic. Each venue organizes its event independently, however, it is intended that in all of them it is offered, at least, observation with telescopes, workshops, artistic activities, and talks. Each year the National Committee selects a representative topic, sometimes of worldwide interest, as in 2009, for the International Year of Astronomy, and other times related to local interests, as in 2012 for the Mayan calendar. Last year, the NdE was dedicated to the 30 years of the HST. As for everybody, 2020 was really defiant, however, we discovered we could reach more people and we learnt many virtual things we will apply these 2021, even if massive meetings are permitted by the end of the year. In this talk we will share our experience organizing the NdE, for sure the largest astronomy outreach party, and maybe the largest science outreach event, in Mexico.

Since March 2020 we live in hard times here in Brazil. The pandemic effects are very strong in our country. We decided, even wit the problems, to continue developing activities of teaching and popularization of Astronomy. We organize every year in our city we organize the International Meeting of Astronomy and Astronautics. In 2020 we cancelled the event. We, the team of the Louis Cruls Astronomy Club, decided to organize online programs to teach and popularize Astronomy then we created the online program ASTROPAPO (astrotalk, in english). The program is transmitted live in facebook, youtube and twitter. We use the live streaming studio Streamyard to produce and transmit the program. The program premiered on March 25, 2020. By March 2021, 88 programs had been produced with a total participation of 75 guests from 34 countries in the Americas, Europe, Africa, Asia and Oceania !!! Most of the programs were transmitted in English and Portuguese, but the official language is Portuguese. We have the participation of translators from English to portuguese and vice versa. The programs had until March 29, 2021, a total of 150,000 views. It will be presented our experience in produce the programs and the results obtained.

In 2019 we assumed the commitment to travel to 18 cities all over the southernmost state in Brazil, Rio Grande do Sul, which is about the same size of Equator or Italy. We developed the same set of activities and contents in each city, which included a two nights teachers training program and two days of school group visits to the mobile planetarium. Also, during the night, we set the telescopes, as well as the planetarium, to be part of the course. We traveled 35.000km from april to october visiting 75 cities where we had about 500 teachers participating in the program and about 15,000 kids visiting the planetarium. During this tour, the teachers answered a questionnaire including the course evaluation, a cultural and social profile and their views about science. From the results, we were able to draw a picture about science outreach activities and propose a policy for the possible creation of new science centers in the state.
**Poster**

**Thanakit Santikunaporn**
Sawatkamol Pichadee

The NARIT Astronomical Teacher Training and Workshop

NARIT has organised “The Astronomical Teacher Training and Workshop” to train teachers teaching in school, especially those who teach in science and astronomy. Astronomy is the subject included in Thai Basic Education Core Curriculum in 2008. The ultimate goal of this particular training is that teachers are able to use astronomy to inspire students on their interests in science, as well as to have good scientific procedures, and search for more knowledge. The training is divided into 3 levels with different objectives. The basic level; inspiring teachers to get the basic knowledge, use astronomical activities to teach students in astronomy and science. The intermediate level; teachers can get more skills for astronomical observing and some ideas to create projects and basic research in astronomy. The advanced level; teachers try to create the astronomical projects with their students, with NARIT close supervision to completion. These trainings are organised by the Public Outreach Department at NARIT, with cooperation from IPSIT (the Institute for the Promotion of Teacher Science and Technology of Thailand). The basic level took place in 2015, with over 5,000 teachers. The intermediate level began in 2011, with up to 294 teachers. The advanced level began in 2012, with 27 teachers, and initiated over 225 astronomical projects.

**Poster**

**M. Sandri**

The Astrophysical Online Code Hunting Game for the European Researchers’ Night 2020

During the European Researchers’ Night 2020, unable to hold events on-site due to the Covid-19 pandemic, National Institute for Astrophysics (INAF) organized the first Online Code Hunting Game entirely dedicated to astrophysics: a treasure hunt to discover places and people who played an important role for the astronomy. In order to get access to the various places where the treasure hunt unfolds, players have to solve coding challenges proposed by a Telegram bot. During the game, players will discover cards/items on a map based on OpenStreetMap – a free wiki world map – that will contain information and relevant links about an observatory, discovery, invention or important event related to the history of astronomy, astrophysics, cosmology or space science. These cards will have a localisation element (geotag) to display them in a city/place that is relevant for the content of the card. This activity was built on the original Code Hunting Game, an in-presence activity developed by Alessandro Bogliolo (Professor of Information Processing System at University of Urbino). The online treasure hunt is a very powerful educational tool that combines scientific dissemination, computational thinking and digital skills, and it can be played in a competitive or collaborative way. In 2020, on the evening of November 27, a national live was held, where citizens of all ages participated. The researchers showed how to play, engaging citizens from all over Italy. The astrophysical treasure hunt is still available on Play – the website for innovative teaching of the National Institute for Astrophysics (play.inaf.it). Now, INAF is going to organise a new online “international” code hunting game based on astronomy and astrophysics open to participants all over the world. Also in this case, the objective is to engage with people in a funny and interactive way, while disseminating information on topics related to astronomy and astrophysics, and increasing awareness for many facilities currently involved in research projects. The new international Code Hunting Game will be presented during the European Code Week 2021 and European Researchers’ Night, between September and October 2021, and it will hosted on INAF’s Play website and on all websites that will request it, and will continue to be available in the future.

**Poster**

**Atharva Pathak**
Sagar Gokhale

Chasing the sun around the globe

Jyotiridvyā Parisanṣṭha (popularly known as JVP to astronomers in India) is India’s oldest Amateur Astronomy Association, established on August 22, 1944 (www.jvp.org.in). It carries out various activities like star parties, basic astronomy courses, study tours, exhibitions, lectures, side walk astronomy; as well as coordinated observations across India with an aim to popularize astronomy and inculcate scientific thinking. JVP also is a coordinator for IOTA for India Chapter and also is the contributor to AVSO for highest number of observations of DSLR Photometry. Many school and college level students are engaged in amateur astronomy activities in JVP and looking forward to carry on these activities and scaling them up to a global effort. The Covid-19 pandemic stopped the regular activities of the JVP and forced us to think differently to carry out activities on social media and educate the people. In the present activity, a live show was conducted over varied period of time documenting sunrise and sunsets across 13 locations all over the world along with a planet viewing session from Pune. The program started with first session from India where JVP members participated from Bengaluru, Ambejogai, Pune and Mumbai. Sunsets from these locations were shown and effect of different longitudes on sunset time and hence the concept of local time was demonstrated. Simultaneously sunrise from San Jose, USA was shown. After the sunset, Planet Venus was shown from telescope and brief star gazing session was conducted online. After this session, brief sessions were conducted to show sunsets at Dubai, simultaneous sunset at Delft, Netherlands and sunrise from Tokyo, Japan, followed by Sunset from Cincinnati USA along with Jupiter-Saturn and Mars show from Pune India, sunset from Auckland, New Zealand, Sunset from Kuala Lumpur Malaysia. All the sessions were conducted on Facebook live and JVP’s YouTube channel. More than 1000 people attended the event live. JVP members are spread across the globe and coordinated activity with these members were carried out to demonstrate simple concepts about apparent motion of sun, local time, effect of longitudes on position of sun in sky etc. Thus JVP made use of Multimedia, Social Media, Immersive Environments and Other Technologies for Public Engagement with Astronomy.
The Historic(al) Way

The historical method to discover something in nature already worked successfully for humans to understand something. As it already had been successful, we should use it in teaching: Let us walk the path of historical development and, thus, learn things in the natural way. Working in astronomy communication (at universities, providing internships as practical training on the job of an astronomer at university, in planetariums, in public observatories,...) we should choose the project method to perform the historical way: In a planetarium show, we can easily display historical constellations and constellations of different cultures and, thus, show the ways of transfer and transformation of cultures and knowledge through centuries. But how did mankind successively understand the distances of celestial objects? Already in antiquity, it was suggested (by Eratosthenes, Ptolemy and others before him) to combine simultaneous observations from different places of the Earth in order to derive the circumference of the Earth and the distances and geographical positions of cities. However, we do not know if anybody really did this or if it was mere theory. In contrast, we know that the Arab scholar Al-Biruni really performed the measurement which was suggested by Ptolemy, to observe a lunar eclipse simultaneously at different places in order to find out their difference in geographical longitude (as we would put it: their different time zones). However, the first really international project of many astronomers all over the world collaborating by observing the same astronomical event was the usage of the transit of Venus in front of the sun in 1761 and 1769. The collaborators were responding on an announcement of the old French astronomer, J. J. Delisle, who aimed to perform the method firstly suggested by Sir Edmond Halley in 1716 to determine the distance of the Sun from Earth. For this method, the French astronomers collected and, later, the German astronomers (Encke, a pupil of Gauss applying his new mathematical methods) evaluated the observational data from many places all over the world and computed the distance to the Sun, the astronomical unit. All these methods require not a single measurement but several observers at different places of the Earth, observing simultaneously and working together - despite their culturally, politically and educationally different mindset and possible further differences. Reproducing these historical methods of discovery, therefore, provides projects with the guarantee of success (because they had been working before), bridges cultures, promotes peace and teaches best scientific practice from all - philosophical as well as experimental and theoretical - points of view. The contribution will present several successful projects which applied this historical method - for some of them students even participated in international exchange programs.

Brazil is a country of continental dimensions. Its territory is cut by two parallels: Equator and the Tropic of Capricorn. A country of great socioeconomic disparities, which influences in the study of the sciences quality. The Astronomy study is deficient in the regions far from large population centers. In these regions the astronomy is little explored by teachers and students of basic education. In this scenario, some basic astronomy concepts present in our daily lives are not well assimilated by most students. For change this reality, scientific educators and communicators have been working at educational projects correlated with scientific discoveries process, by the collaboration between schools, universities, technological institutes and astronomy clubs, aiming contributing to the improvement of astronomy training. As an example we have the Eratosthenes Experiment that consists at measure of angles of the shadows projected by equal vertical sticks (at noon time) positioned in near longitudes, at certain times of the year. Using basic geometry concepts and knowing the distance between the measurement locations, it's possible to estimate Earth's circumference value. This work was based in the global action "Eratosthenes Experiment" project organized by the Research and Development Department of Ellinogermaniki Agogi – Greece [1]. The engagement between science educators from four institutions located in Brazil allowed, simultaneously, reproduce the Eratosthenes Experiment. All experimental activity was online transmitted by YouTube video platform, with teachers and local students participation aiming of adding more knowledge to the community. The data were collected in the brazilian cities Macapá, Imperatriz, Jataí and Itapetininga, being Macapá at zero latitude (Earth's Equator) and Itapetininga at Tropic of Capricorn latitude. The Experiment was reproduced twice in 2020 year, at the spring equinox (September 22) and summer solstice (December 21). The action made possible to determine the Earth's circumference value, local latitudes values and estimate the Earth's Axial Tilt. This experiment has a didactic-pedagogical importance and can be reproduced by educators at all levels of formal education as a motivating element, correlated with description of achievements of ancient astronomers and their efforts to unravel the mysteries of our universe with limited resources at the time. The activity allows knowing and applying experimental data, developing knowledge such as geometric constructions, trigonometry, ratios and proportions, geographic coordinates and geolocation, concepts that demonstrate that the action promote interdisciplinarity with teachers and students. The institutions involved are Federal University of Jataí, Federal Institutes of Education, Science and Technology of Maranhão and Amapá, and Centauri Astronomy Club. [1] Available in https://eratosthenes.ea.gr/, access in 12/03/2021.
Here we present our experience of participating in the NameExoworlds 2019 competition. NameExoWorlds offers the opportunity for all countries in the world to give a name to one exoplanet and its hosting star. Senegal thanks to its NOC network had the opportunity to name for the first time a planetary system following this competition which is being organized for a second time at the global level. The competition is one of several programs that have been planned as part of the celebration of 100 years of IAU. The success of this campaign was on the one hand the commitment of the NOC network at local and international level, and on the other hand the inclusiveness of the project which allowed people without a background in astronomy to participate in the competition. During the collection we received 24 proposals that met the naming rules, from participants from different regions of Senegal as well as students and amateur astronomers. Thus Senegal was able to name the exoplanetary system whose star is HD 181 342, a star of the constellation of Sagittarius.