

Manuscript version: Published Version

The version presented in WRAP is the published version (Version of Record).

Persistent WRAP URL:

<http://wrap.warwick.ac.uk/171524>

How to cite:

The repository item page linked to above, will contain details on accessing citation guidance from the publisher.

Copyright and reuse:

The Warwick Research Archive Portal (WRAP) makes this work by researchers of the University of Warwick available open access under the following conditions.

Copyright © and all moral rights to the version of the paper presented here belong to the individual author(s) and/or other copyright owners. To the extent reasonable and practicable the material made available in WRAP has been checked for eligibility before being made available.

Copies of full items can be used for personal research or study, educational, or not-for-profit purposes without prior permission or charge. Provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way.

Publisher's statement:

Please refer to the repository item page, publisher's statement section, for further information.

For more information, please contact the WRAP Team at: wrap@warwick.ac.uk

Reach out, touch space

Tishtrya Mehta, Catriona McDonald and Bec Nealon take an overarching look at the stellar week of fun and engaging outreach activities that formed part of NAM 2022



In addition to the scientific riches on display at the National Astronomy Meeting, there was also a jam-packed programme of outreach, with hands-on activities bringing together the local community and the hundreds of delegates attending the meeting in person. Alongside the standalone events throughout the week, NAM2022 hosted a Science Festival, packed with fun and engaging activities set up by scientists, technicians and experts for kids and curious adults. These ranged from building your own 'Star-on-a-Stick' and getting the chance to look at the Sun with your own eyes (safely!) with 'Solar Telescopes'.

The Science Festival

On Wednesday 13 July, some 500 members of the public of all ages from babies to curious adults came along to explore the displays and interactive stalls, and to talk to experts in the field eager to share their passion for their science.

The Tactile Universe project, showcased by Nic Bonne (University of Portsmouth) and co-developed with Jen Gupta and Coleman Krawczyk aims to bring astrophysics and astronomy to the visually impaired community through the use of 3D printed models of images of galaxies – enabling the audience to experience the universe through touch.

"The Tactile Universe Project really struggled during the pandemic because of its strong focus on hands-on resources," said Nic. "The NAM 2022 public outreach evening was one of the first in-person events we've been able to take part in since the national lockdowns were lifted, so it was really wonderful to be able to meet so many enthusiastic members of the public face-to-face and encourage them to 'feel' the universe."

Marina Lafarga Magro and Laura Millson (both University of Warwick) took visitors on a tour

These models of galaxies were created as part of the Tactile Universe project. More information can be found at TactileUniverse.org (Tactile Universe)

of recently discovered exoplanets, explaining the crucial role of exoplanet atmospheric spectroscopy in determining the properties of these far-flung worlds. Audience members explored the '**Spectra of exoplanets**' using diffraction glasses, which split the light in the room into a whirlwind of colour to the surprise and excitement of adults and children alike. Laura and Marina then discussed how the minute differences in the spectra detected on different exoplanets imply differences in planetary atmospheric composition, which can be seen in the vast variety of exoplanets detected, of which many are extremely different to the planets in our own solar system.

Meanwhile Warwick-based helioseismologist Anne-Marie Broomhall led '**Star-on-a-stick**', in which children were encouraged to let loose their artistic sides, using papier-mâché to create a host of stars in red, blue, white and gold to represent the real colours of the stars we see. In addition, they used pipe cleaners to make coronal loops and glitter glue to mimic stellar campfires, and everyone walked away with a souvenir to keep and a newfound appreciation for the beauty of space. The activity was nicely summed up by one young attendee who, when asked about their experience of Star-on-a-stick, joyfully cried "THIS IS EPICCCCC!", while clutching a binary star system (one in each hand).

Also embracing the intersection of art and solar physics was Helen Mason OBE (University of Cambridge) who runs SunSpaceArt, an STFC funded STEAM project (Science, Technology, Engineering, Arts and Mathematics) which aims to bring together scientists and visual artists to work in schools alongside teachers. The '**Creativity with solar physics**' sessions, co-run by artists Clare Dudeney and Helen Schell encouraged children to create their own 3D collages of solar environments, showcasing phenomena such as prominences and granulation. Volunteer Amena Faruqi worked with the SunSpaceArt team and said: "Watching the students combine their creativity with their new-found astronomy knowledge was incredibly heart-warming, and I'm confident there were a few future astronomers (and artists) in that room!"

Another project embracing both science and art was '**Embroider a Sunquake Coaster**', led by Tishtrya Mehta (University of Warwick).

The activity incorporated a coding element whereby the audience designed their unique sunquake designs (the spirograph-like pattern produced from helioseismic waves) using a program called TurtleStitch. This design was then moved to a programmable embroidery machine which sewed





the pattern on to a piece of felt, which they then stuck to a decorated cork coaster to take home. Attendees were particularly positive about seeing physical phenomena in an artful way, with an audience member leaving the feedback: "A fabulous fusion of STEAM; from the science of sunquakes to the geometry of their patterns harnessed by the engineering to make Computer Aided Manufacturing felt embroidery – which only became better as a coaster! Love it!"

On the other side of Warwick Arts Centre, Bec Nealon from the Astronomy and Astrophysics department at Warwick, was leading an interactive coding adventure, in which audiences helped an astronaut called Sophie get out of the solar system by solving programming puzzles. 'Coding with Sophie' allowed children to explore 'do loops' and 'if statements' to navigate a virtual rocket through an asteroid belt to safety, having fun while learning the basics of coding. During the evening siblings and friends could be seen racing each other to save their astronaut first. A parent got in touch the next day enquiring how she could get the activity into her child's school, as "it was all [my] son could talk about!"

Nearby was John Pye from the University of Leicester who led an exhibit on 'how JWST sees space in the infrared', using an infrared camera to engage audiences. Attendees spoke one-to-one with experts, finding out about the data, engineering and science, with focus on the UK contributions to the mission. A one-third scale model of the MIRI instrument also enabled visitors to get a real 'hands-on' experience.

The **Inflatable Planetarium** was the talk of the evening, with Warwick academics Lauren Doyle, Conor Byrne and David O'Neill showcasing a tour of the night sky in seven sold-out shows, covering all topics from constellations to the life-cycle of stars.

On the other side of the Arts Centre we turned away from the dark night sky and embraced the Sun



Artwork made during one of the 'Creativity with Solar Physics' sessions led by Helen Mason OBE (Helen Mason)

Sunquake coasters made by attendees of the 'Embroider a sunquake coaster' activity (Tishtrya Mehta)

with 'Solar Telescopes' in the surprisingly bright and cheerful British sunshine. Local astronomers Alasdair Czaplewski, Miranda Norman and Tom Killestein guided spectators on how to see the usually hidden features of the Sun; sunspots and faculae were all brilliantly prominent. Tom commented that there were lots of great questions; the visitors regularly, and correctly, told the team that "looking at the Sun is dangerous!" provoking interesting conversations about how to safely observe such a powerful star.

Local school initiatives

Outreach at NAM was not limited to the science festival – there were many more standalone exhibits and activities for both NAM attendees and specially invited Year 5 and 6 students from local primary schools.

This included an expert panel on the newly released **JWST images** led by Mike Edmunds (University of Cardiff), panel chair and President of the Royal Astronomical Society, who was joined by Eva-Maria Ahrer (University of Warwick), Libby Jones (UK Astronomy Technology Centre), Piyal Samara-Ratna (Space Park Leicester), Becky Smethurst (University of Oxford) and Stephen Wilkins (University of Sussex).

"The inflatable planetarium was the talk of the evening, with Warwick academics Lauren Doyle, Conor Byrne and David O'Neill showcasing a tour of the night sky in seven sold-out shows"

The JWST telescope was launched on Christmas Day 2021 and the long-awaited first scientific observations did not disappoint. The panel was streamed live on YouTube and has been viewed close to 2000 times to date.

Warwick Arts Centre Cinema also got involved, hosting the screening of **Arrival (2016)**, the science-fiction drama telling the story of a linguist interpreting the language of aliens who have arrived on Earth. Based on the short story by Ted Chiang, and directed by Denis Villeneuve, *Arrival* has firmly found itself as a modern-day classic, with its intriguing, thrilling and introspective plot. The screening was preceded with a talk by Manchester Metropolitan University's Amy Chambers who discussed the 'Representation of scientists in film'. "There is a changing culture of how science is viewed in entertainment and how it genuinely enhances a story and makes it more entertaining," said Amy. "Accurate science can create restrictions, but the process of working around and creatively through these problems can potentially lead to new and exciting stories and act as inspiration for 'new' science too".

Organizers also put together a community-driven art exhibition, presented at NAM entitled the '**Our Beautiful Universe' Art Gallery**. Submissions fell into six different categories; Stars, Space Exploration, Transients, Beyond our Galaxy, The Solar System and Exoplanets, and covered many different art forms, from astrophotography, to stained glass and digital art, with everything in between.

The standout exhibit during the week was the larger-than-life installation of **SUN**; a seven-metre diameter floating artwork which pulsed and shone with real videos of the Sun's surface and atmosphere, captured by NASA's Solar Dynamics Observatory. The art piece was inflated and suspended in the vast Butterworth Hall, so that children and adults alike could walk around and beneath it. They watched as the projections showed first the

photosphere, the deepest layer of the Sun's surface bubbling with granulation patterns, then higher layers of the chromosphere, with sunspots, flares, and loops all visible. Smoke gently engulfed the installation, representing the solar corona. The looping videos condense 10 weeks of the Sun's life into twelve and a half minutes, accompanied by an original soundscape from Ebe Oke featuring the voice of counter-tenor Feargal Mostyn-Williams which only added to the ethereal atmosphere.

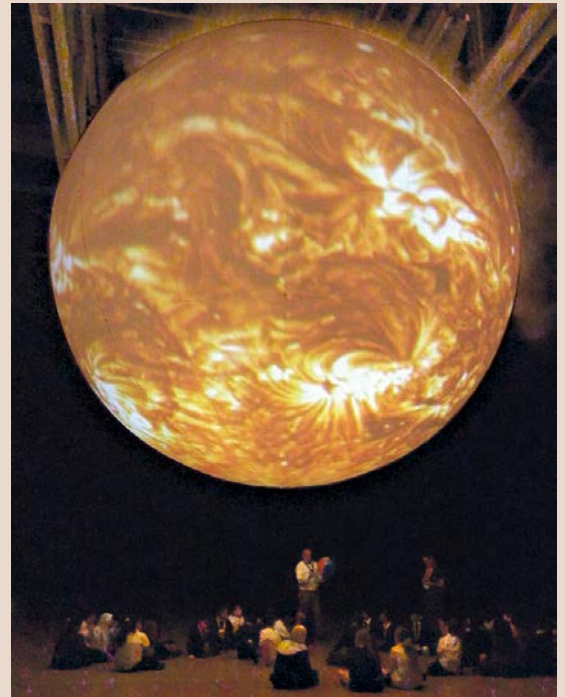
On the Tuesday evening, SUN was accompanied by a live musical 'Space Opera', alongside science talks from Robert Walsh from the University of Central Lancashire and Warwick's Sandra Chapman. The art piece is a collaboration between Robert Walsh and UK artist Alex Rinsler and was fully booked all week with more than 1000 delegates and members of the public visiting. SUN will continue to tour the UK and Europe, and is supported by Arts Council England and STFC.



A submission to the virtual art gallery, entitled 'Galactic Spinner', made using stained-glass by Brian Dickinson (@Brianatdolitlle)

Leaders of several of the outreach activities through the week got together to offer **Mini Solar-Physics Masterclasses** for local primary school children. Year 5 and Year 6 students from seven local schools in Coventry were invited for specialist solar physics masterclasses, led by Helen Mason OBE, Heather Celga, Anne-Marie Broomhall, Tishtrya Mehta, and Lauren Doyle. These classes gave almost 250 young scientists between the ages of 9 to 11 the chance to engage in exciting discussions on topics ranging from the births and deaths of stars, different forms of matter, what makes the Sun magnetic, and what else is out there. The classes then took part in the Creativity with solar physics and Star-on-a-Stick activities, much to the joy of the students who could be seen proudly holding their new masterpieces. Their visits included a trip to the SUN installation, accompanied by awe-filled gasps as the colossal art piece lit up the stage. A teacher later got in touch with us to say "This can often inspire the children across the whole class and also for some children whose family have never been to university see that the opportunity is there for them. It was also great for my girls to see that most of the physics staff were female as often our girls don't see themselves as natural mathematicians compared to boys and this showed them that they are more than capable."

Students from Radford Primary School sit beneath the 7m SUN installation. (Radford Primary School)



On reflection

The success of the outreach programme at NAM 22 is evident from the hundreds of visitors throughout the week – and the praise for the staff, activities, and engaging content that we received as feedback. Volunteer Amena Faruqi summed up the events: "It is hard to overstate how valuable this kind of outreach is for encouraging scientific curiosity in young minds but for anyone who was there, the impact was impossible to miss". Catriona McDonald, who co-chaired the outreach organization committee, alongside Bec Nealon, commented: "Seeing all the attendees having such a wonderful time was amazing, queues for planetarium shows and people enjoying all the artwork was great." ●

ACKNOWLEDGEMENTS

The week of outreach and public engagement could not have been possible without the efforts of the Chairs of the Outreach Organizing Committee at Warwick, Bec Nealon and Catriona McDonald who worked terrifically hard putting together many events throughout the week. Also great thanks must be given to the staff at Warwick Arts Centre who ensured the Science Festival ran smoothly and to the scientists and technicians who put together the brilliant exhibits. Ally Caldecote was indispensable in facilitating the exhibitions, in particular the SUN installation. Thanks also goes to Soheb Mandhai who led the SciArt session, alongside Jake Noel-Storr, John Paice, Jenni French, Kelly Stanford, Mariam Rashid, and Laurence Datrier, many of whom contributed their own art to the gallery and put together a marvellous spectacle. Finally we thank the brilliant and engaging volunteers who were instrumental to the success of the week and gave up their time to run the activities: Mairi O'Brien, Marina Lafargo Magro, Alina Bendt, Tom Marsh, Alun Rees, Amena Faruqi, Gareth Jones, David O'Neill, John Pontin, Laura Millson, Ingrid Pelisoli, Pat Cronin-Coltsmann, Raphael Bendahan-West, Martin Farnir, Faith Hawthorn, Deanne

Coppejans, Gareth Jones, Snehalata Sahu, Wiktor Gondek and Emma Wride.

AUTHORS

Tishtrya Mehta is an award winning public engagement enthusiast and solar physics PhD research student at the University of Warwick, who researches quasi-oscillatory behaviour in helioseismic and flare data.

Catriona McDonald is a PhD student in the Astronomy and Astrophysics group at the University of Warwick working on planetary system dynamics and evolution, who has a keen passion for outreach contributing substantially to the organisation of NAM 22 and the running of the university's inflatable planetarium.

Dr Rebecca (Bec) Nealon is a Stephen Hawking Fellow and Assistant Professor working in the Astronomy and Astrophysics Group at the University of Warwick, researching accretion discs and planet formation. Alongside developing new public engagement tools, Bec co-organized the outreach programme at NAM 22 and works to improve equity in Physics.

