

Public engagement in MIST

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The MIST+PE meeting, recently held at the University of Leicester, brought people from around the MIST community together to discuss public engagement and the strengths and weaknesses of the community's approach to communicating with the public. The keynote speaker, Jean Lilensten, is well-known in the public engagement community for creating the planeterrella, a tool primarily used for public engagement based on the terrellas originally created by Kristian Birkeland at the turn of the 20th century. The meeting was designed to lay a foundation for continuing collaboration in public engagement, which we (the co-convenors) feel is something the community needs to do a better job of.

The meeting was partly inspired by the excellent Interact symposium, which was held in 2017 as a joint partnership between STFC, SEPnet, the IOP, and the University of Birmingham (who hosted the event). This conference focused on bringing science communicators and those doing public engagement together to discuss best practices and share expertise amongst communicators across the UK. Attendees were allowed to propose workshops which were then voted on by attendees to create a programme for everyone who attended, and we adopted a similar model for our meeting, asking attendees whether there was anything they thought should be covered or anything that they wanted to run at the meeting. From the offers from attendees, we were able to put together a mixture of talks, interactive workshops and panels tackling everything from engagement in schools to setting and evaluating the objectives for a grant application.

The meeting got started with the invited lecture by Jean Lilensten (IPAG). He gave a fascinating talk, simultaneously catching us all up on our auroral physics while telling the story of Kristian Birkeland and the original terrella. Birkeland was lucky to hit on the correct pressure to make his terrella work, and actually built 14 different terrellas, varying the volume within the experiment as well as the electric and magnetic field configurations. You can see a terrella, which is a reconstruction helmed by Terje Brundtland, in the Teknisk Museum in Oslo; it's based on a terrella kept in the basement of the University of Oslo. Lilensten then talked about recreating the terrella for the Olympics of Physics in 1996, and he then talked about making a planeterrella, including two spheres in the chamber instead of just one. This new wave of planeterrellas have been a vital part of MIST public engagement ever since Lilensten conceived the first one. In fact, the first planeterrella after Lilensten was based here in the UK, constructed at the University of Leicester by Gabby Provan, and John Coxon has constructed a second British planeterrella at the University of Southampton, engaging people across the South East. This talk provoked a lot of questions from the attendees, and naturally one of the questions was 'how easy is it to build a planeterrella for my institution?' – if you're also wondering that, please contact us!

The keynote was followed by lightning talks from some of the attendees. One of the objectives of this meeting was to get a better impression of the public engagement being done across the community, and so attendees who have done engagement were given the option to give a lightning talk outlining the work they had done. The first speaker was Nathan Case (Lancaster), who spoke about AuroraWatchUK. Many readers will already be familiar with this service, which provides alerts when aurora are likely based on magnetometer readings taken in Lancaster, but you may not be aware that they have hundreds of thousands of followers on social media and views on their blog, so they're good people to talk to if you want an online component in your engagement programme! Helen Mason (Cambridge) talked about her SunSpaceArt project, which aims to connect art and science in schools by having students create images of the aurora. She also maintains the Sun|trek website, which is designed to educate people on the effect

the Sun has on the Earth. Jenny Carter (Leicester) talked on two topics – firstly, the topic of the outreach being coordinated and inspired by the upcoming SMILE mission. SMILE is the only confirmed upcoming mission in MIST science, and the mission therefore represents a huge opportunity both to engage the public with MIST science but also the process of designing, building, launching and operating a spacecraft. Secondly, she showed off a prototype of a tactile model of the Dungey Cycle designed to help engage the visually impaired with MIST science (similar to the Tactile Universe). Josh Barker (National Space Centre) talked about the Association of Science and Discovery Centres (ASDC), explaining some of the campaigns that have been previously run through that organisation and urging people to consider talking to their local science centre about collaborating on public engagement. James Plank and Sai Pandian (Southampton) talked about Aurora Zoo, which is a new citizen science project to identify auroral forms from images taken by the Aurora Structure and Kinetics (ASK) telescope operated by Southampton at EISCAT in Svalbard. Citizen scientists identify auroral structures in images 3° by 3° in size – which is 5 km by 5km at an altitude of 100 km [*Ashrafi, 2007*]. Colin Forsyth (UCL/MSSL) discussed his Electric Magnetosphere, a demonstration of the effects of electric currents on the magnetotail which uses iron filings in acrylic cubes to let students see this in situ, and shared some of the lessons he learned in building one. Finally, Will Dunn (UCL/MSSL) spoke about long-term engagement by repeated interventions in schools, and detailed how he started with one school before scaling up to 25 schools this year. Six papers have come from the collaboration with over 30 school students as co-authors!

After the keynote and lightning talks, the day comprised panels and workshops designed to discuss and engage people with some of the issues inherent in public engagement. The first of the two panels saw a discussion on how to balance engagement with other aspects of academic jobs. Will Dunn, Jenny Carter, Nathan Case, Helen Mason, and Alexandra Fogg (Leicester) appeared on the panel, giving a balance in levels of expertise – from PhD student to permanent staff – and also in styles of engagement. Most of the panel had already introduced themselves via lightning talks, but Fogg outlined some of the outreach she had been doing with adults in local colleges and in other parts of Leicester, including a planetarium in Leicester Cathedral. Perhaps unsurprisingly, the panel all felt that engagement was an important part of their job, but methods of keeping a work-life balance and a research-engagement balance varied, ranging from no-email days to learning how to say no to neat new projects. The difficulty of being recognised for engagement when it comes to promotion was raised, and it was pointed out that engagement is becoming more and more recognised in promotion applications at Cambridge, although it is still hard for postdocs. The EDGE tool from the National Co-ordinating Centre for Public Engagement (NCCPE) was mentioned, which helps institutions evaluate how well-integrated their public engagement is. French PhD students are required to do up to 60 hours of teaching a year and public engagement counts towards that, whereas some British PhD students are now required to write an impact statement on their PhD thesis, so perhaps methods to require and to integrate engagement in departments are the way forward. Other methods for recognising engagement as ‘proper’ work is publishing papers in science communication journals or by using citizen science. The panel concluded by giving the best single piece of advice each member could think of. Carter advised compartmentalising and being strict with your time; Case recommended finding a mentor who’s experienced with engagement; Mason and Fogg both recommended being good at predicting when you’re going to be busy, and learning how to say no.

The second panel talked about engagement in schools and was moderated by Helen Mason, featuring Josh Barker, Will Dunn, and Suzie Imber. This panel was motivated by the fact some public engagement projects have been having trouble getting a presence in schools, and the panel discussed some of the potential pitfalls posed by school engagements. The issue that teachers often have is having a limited amount of time to teach the National Curriculum, and not having enough time to spend on lessons that don’t fit into their plans. Both Dunn and Mason have done repeated interventions in schools. Imber’s

experience going into schools is hugely affected by her experience on *Astronauts: Do You Have What it Takes?*, which she won – she tweeted shortly afterwards expressing an interest in schools engagement, quickly starting to go into school. Barker raised the issue that trust is also a key factor when convincing teachers to let you into schools, and seeing a potential science communicator on the television, or hearing about that communicator from a fellow physics teacher, may help to build that trust. Mason suggested that one way of getting into schools was to target organisations who help to train teachers, like the Association of Science Educators (ASE). The issue of repeated interventions was raised, and although obviously repeated interventions are a good way to impact students, it was pointed out that teachers refer back to successful school engagements, so you do get a cascade from a single intervention which increases impact in a way that is difficult to quantify. One recommendation was to tell students and teachers that you're available by email for future physics questions and discussions, thus also improving your impact from a single intervention. The panel rounded out again with a single piece of advice. Barker recommended being careful with language, especially avoiding gendered language: for example, referring to 'crewed' instead of 'manned' spaceflight. Dunn highlighted the availability of great publications and content from third parties and Imber recommended giving schools links to information or recommendations to other communicators, if they ask for your time at a point where you can't spare it. Mason wrapped the panel up by emphasising how vital it is to be aware of the technology that will be available to you when you visit a school – checking projectors, making sure the room is dark enough for certain demonstrations, and so forth. All in all, the panel had many great recommendations!

The workshops were much more interactive, focusing on getting people's creative juices flowing and encouraging people to think about public engagement and how to come up with ideas, how to target those ideas, and how to write grant proposals to achieve funding for those ideas. Gabby Provan (Leicester) ran a workshop after lunch looking at identifying styles of engagement, and how to vary engagement based on the audience being targeted. This practical workshop was designed to get people thinking about how to most effectively engage with their desired audience. We split into groups and discussed the characteristics of different demographics, which was enormously helpful for those of us in the room less well-versed in public engagement. This theme continued with a workshop run by Martin Archer (QMUL), who looked at engaging beyond your comfort zone, using his very successful SSFX project (<https://ssfx.qmul.ac.uk>) as an example of coming up with innovative public engagement ideas to reach demographics that it might otherwise be hard to reach. SSFX engages filmmakers, but other ideas in the room imagined reaching all sorts of interesting demographics, and really started to show the creative side of attendees! The last workshop of the day was developed by Ciaran Beggan and Gemma Richardson (BGS), and looked at how to transfer an idea for engagement to a grant application, focusing on converting the idea to aims, and then converting those to measurable objectives. In grant proposals, it's important to have a way to measure how successful your project was, and this workshop got people thinking about how to do that for grant proposals.

The final session of the day focused exclusively on where we, as a community, go from here. How do we keep in touch, how do we collaborate, how do we have further discussions? We decided that we needed to use the MIST website more to promote our public engagement efforts, both by providing pointers for teachers and journalists to find members of the community who are active in engagement and science communication, but also by introducing a page focusing on public engagement and what's being done in the community. This is now online at <http://www.mist.ac.uk/public-engagement> – if you have a MIST-focused public engagement project that doesn't appear, please let us know! It was suggested that aspects of the website could also be focused more on engagement: for example, the nuggets. The new MIST Slack room was mooted as a potential avenue for online discussion, with the proviso that if it wasn't widely used, a public engagement-focused mailing list might also be a wise way to share resources. We also want to meet more in person, and we are looking for ways in which we can hold sequels to the meeting, as well as ways we can incorporate MIST+PE into other meetings such as Autumn MIST, or

even public engagement events such as Interact. Finally, there was consensus that a coherent MIST+PE strategy was needed, and so this is something that will be discussed by MIST Council in the future.

If any members of the community who read this have any other ideas for how to continue and how to improve MIST's public engagement in the future, we're all ears – the idea of this meeting was to start a discussion and community-wide collaboration which will benefit the community for years to come.

References

Mina Ashrafi; ASK: Auroral Structure and Kinetics in action, *Astronomy & Geophysics*, Volume 48, Issue 4, 1 August 2007, Pages 4.35–4.37, <https://doi.org/10.1111/j.1468-4004.2007.48435.x>



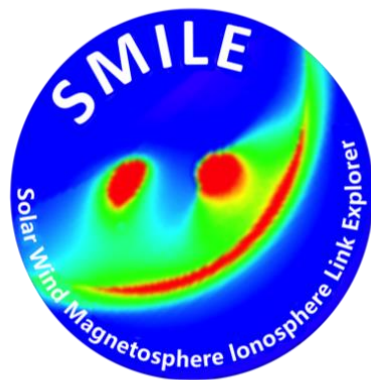
(a) SunSpaceArt workshop. (Helen Mason)



(b) Martin Archer on stage at the Space Sound Effects film festival. (Gary Schwartz)



(c) Schoolchildren learning about light. (Will Dunn)



(d) The SMILE mission logo.

