

Citizen Science Presentations: AAS #244: June 10, 2024

AAS Summer Meeting #244 June 10-11, 2024
First Look at Citizen Science from the 8 April 2024 Total Solar Eclipse
June 10, 2024: 2:00 PM - 3:30 PM

Trae Winter: Eclipse Soundscapes

[Click here for the YouTube video of this talk.](#)

Trae will be talking about the Eclipse Soundscapes project.

All right. Hi, everyone. My name is Trae Winter, and I am representing ARISA Lab and our Eclipse Soundscapes project. I am the co-founder of the Advanced Research and Inclusion and Steam Accessibility Lab. The other co-founder, Mary Kay Severino, serves as our education director and has been doing a lot of work on scientific identity. But since she's not at this meeting and I am, and I am the chief scientist, I'm going to be talking about the data and science of it.

All right. So what is "Eclipse Soundscapes"? First of all, it's "Eclipse Soundscapes." Lots of people refer to us as NASA Soundscapes. There are actually three NASA's soundscapes projects. We're the ones that are seeing the eclipse and we are a science activation backed citizen science program. And when you're doing citizen science, you have to have a scientific question. And our scientific question was how do eclipses affect life on earth? That's what we want to know. And specifically wildlife.

So we actually had another project for the 2017 total solar eclipse, where we very much focus on accessibility of the eclipse. But we were very fortunate to have this idea for Soundscapes then... we couldn't actually achieve it then, but we got to use the annular eclipse as a beta test and actually do our science during the April 8th eclipse this year.

And it's all based on a study that was done almost 100 years ago where a scientist by the name of Wheeler had people write down their observations of animals during an eclipse and what they experienced, because everybody talks about how animals change their behavior during eclipse, but nobody had really scientifically researched it until then.

So we decided to recreate that study with more advances in science, tools and best practices, and new technology. And I say "citizen science" because that's what people are more familiar with. But we're transitioning to a new name, which is "participatory science," because we don't really care about your nationality.

So what this story showed was that people don't only use their eyes to actually observe Eclipse and to see how things change, but they also heard changes. They heard changes in bees and animal noises. And they also felt temperature changes like our friends at Globe actually measured.

So what we realized is that we could use this eclipse as a multi-sensory event, and we decided to do that so that we could include participants in actually doing NASA science that typically felt like they could not be part of science, and definitely not part of something astronomical like an eclipse.

And so what we decided to do was to invite people to work with NASA science, NASA scientists and experts, and learn about solar eclipses, and actually record animal sounds, how animals change their noises during the eclipse using these great little devices called an audio moth.

If you're interested in citizen science, actually scientific data reporters have come down on price. These guys, if you buy them in bulk at a special time, you can get them for about \$80 apiece, which meant that we could actually hand them out all across the U.S. And they used a little micro SD card about the size of your pinky nail. And for 64 gigabytes, they're only about ten bucks apiece if you buy them in bulk.

But we wanted to have people submit their observations and then analyze data. But our focus was always on inclusion. How do we get everybody to participate? And we worked very strongly with the National Federation of the Blind and other groups, including New York University's Tandberg Hansen Design School, to make sure that everything that we made were accessible to multiple different groups, with a special focus on people who were blind or had low vision, because typically they are left out of the astronomy enterprise.

And Dr. Emslie's here, and Gordon is probably thinking, "Why are you studying animals? You can use my electron flux calculations to study solar flares... Why are you studying animals when you're supposed to be a solar physicist?" Well, one, everybody knows I wasn't a great solar physicist, but two, I started off here and I worked backwards. So the slides are in the way that people think science goes.

You start off with the question. I started off with, how do you include people who are blind, low vision and doing eclipse science and then work backwards?

And not only did we get to revisit that ... but I'm very proud that we were able to work with the National Park Service, both in 2017 and this year and do studies with them as well.

All right. So as part of our inclusion, right? It's not just reporting science, but not everybody was going to be able to get one of our audio moth recorders, because there are some costs involved and they might be out of the path. So we wanted to have multiple ways that people could actually participate.

And so one way was as an apprentice. So you could go online, you could learn about eclipses, what forms them, why there are different types. And we developed a lot of

teacher materials as well as materials both in English and Spanish that could be used right out of the box. And so people could go online, learn about eclipses and become... and get a certificate saying they were official NASA Eclipse Soundscapes Eclipse Apprentice.

We also had this observer role, which a lot of people used. It was basically having people directly recreate that Wheeler study, but actually being present during the eclipse, actually experiencing with all of their senses what an eclipse was and submitting those observations back to us. This was a low-lift activity. It was just a printout. So actually these were handed out national charts all across the U.S. and it's just a very easy, fun activity for people to do.

The one that actually gave us most of the quantitative data was data collector, where people were trained on how to use these audio moth devices. They set them out two days before the eclipse so we could get two days of pre-eclipse baseline, left out on the day of the eclipse, and then collect it two days after the eclipse so we could get some post eclipse baseline as well. And then the last role that people can participate in is actually analyzing the data. But I'm going to talk about that a little bit later.

All right. So we did all these different roles and everything except for the data collector we kind of did after we had proposed. So, you know, we were thinking maybe a few hundred people would do it as long as the numbers were like under a thousand or so, we could probably, you know, do all these extra things without too much workload.

So for the apprentice role, we had 3425 people participate across the country for the observer role. We had another 3373 people and we were only supposed to do about 400 audio moths total for both the annular and the total eclipse. But we had 1300 people signed up over... we had 770 devices registered. Out of those we got the locations online for 424 of them, and we've currently gotten 404 mailed in with more coming in every day because the [?] in charge of the US Postal Service. So they're still coming in.

Here's a quick map of all of our data location sites, both on and off the path. And because I'm a data scientist, I wanted to show you that this is the rig that we've got for actually uploading all those of micro SD cards that we're getting. We had to change our plan mid-program because our data partners no longer could do what they said that they were going to do. And I want to point out that if you want to set up a home lab style data collection system for under \$1,000, all of that was under a thousand. And I know a guy.

And so you might be asking, "Trae, why if the slow part is actually putting in all those micro SD cards in the slots, why didn't you have them do that?" And that's because inclusion is important.

I'm not going to go through everything on this slide, as I'm running a little bit over time. But I just know this statistic out here. The data cards were 64 gigabytes, as people record about 60 gigabytes. This is the average speed that the U.S. of Internet and it would have taken over 26 hours total download time.

So to make sure the people in rural areas and different places that didn't have Internet access could also participate, we had people mail them. This is the data

analysis part and I am going to skip to the next one and that's my time. I wanted to show that out of the three different locations that we did in Hot Springs, we actually got a very strong signal, which is this yellow line.

So this is power spectral density. This is how we're measuring change and soundscapes are all the sounds of the environment. We have a huge change on Eclipse Day as compared to these two other days of peak data, and people will be analyzing that data to tell us what was actually making that sound. This is a very rushed presentation, I'm about to get the hook, so if you want to know more, please contact me. We're putting all the information on YouTube, and we've got far more information on our website eclipsesoundscapes.com.