S3_E17_Asterism_MariaMitchellSunspots_Sagitta

Intro

Jordan: Hi, I'm Jordan.

Kit: And I'm Kit.

Jordan: Welcome to Starry Time Asterisms Edition, where stars plus signs equals stories

Ki: with an asterisk.

Jordan: In these episodes, we get to explore ideas, concepts, or people that didn't make it into the main show. Or maybe just something we'd like to talk about a little bit more.

Kit: In today's episode, we're going to be talking about Maria Mitchell and sunspots. As with most of our Asterism episodes, we're not going to get super detailed, but we will post more links and information about Maria Mitchell on our socials when this episode comes out. And that's starrytimepod on the Universeodon server of, Mastodon, which I'll post a link directly to in our show notes.

A Brief History about Maria Mitchell

Jordan: Maria Mitchell was born on August 1, 1818, in Nantucket, Massachusetts.

Kit: Oh, we're almost birthday twins.

Jordan: You're almost birthday twins. So close. So, so close. She was raised in a Quaker household, and she was quite close to her family throughout her life. Growing up on Nantucket, her father taught her how to rate chronometers for whaling ships.

Kit: This reminds me that because we grew up in New England, our middle schools did a bunch of, like, whaling history lessons. Um, and talking to one of my friends and I was like, yeah, like, remember in middle school, like, we learned so much about whaling. We went to, like, a whaling town, and this person grew up in the Midwest, and they were like, um, that's just some New England bull-bleep Um, so, so I don't know people from New England, at least, at least in our school, we know an aggressive amount of whaling, uh, stuff. But I, I guess that's not normal.

Jordan: I mean, it's surely a skill that's helped you throughout your life, correct?

Kit: Not as much as it helped Maria, who learned how to use a number of these astronomical instruments because of where she grew up in the industry of whaling at that time,

Jordan: Kit, I think that was our real problem. They taught us all the historical facts about whaling, but not how to use any of the cool tools. Then we could show off instead of just being like, scrimshaw, Herman Melville. Maria has a number of claims to fame, but the one that put her on the map was her discovery of a comet on October 1, 1847. She became something of a celebrity. During this time, she was working as a librarian

in Nantucket during the day, but she loved math and astronomy, and at night worked with her father to do calculations for the US Coast Survey. Again, more things we could have learned in our whaling lesson.

Kit: The comet she observed was called Comet 1847 VI, but with Roman numerals. And it's now called C 1847. It also, of course, has the name Ms. Mitchell's Comet. It was only observable with a telescope. And the reason why Maria was looking was because there was some kind of competition to identify comets not visible to the human eye. So there was some call for these, uh, comets to be identified. And so she published her findings of this comet under her father's name and also calculated the comet's orbit and was awarded a gold medal by the King of Denmark for this discovery.

Jordan: I miss the days when you could get gold medals not just for athletic accomplishments, but for intellectual pursuits. I could work for a gold medal. That's a strong incentive. She was just the third woman to be recognized as discovering a comet after Caroline Herschel and Maria Magareth Kirsch. And we've already got a Caroline Herschel and Comets episode on the docket at some point in the future. I think that's coming soon, right?

Kit: Yeah. Spoilers. Um, it's definitely on the docket for this season.

Jordan: After she discovered this comet, Maria Mitchell was sort of vaulted into stardom. She became friends with a number of influential academics, suffragettes, and anti slavery advocates.

Kit: Later in her life, she would go on to help found the Association for the Advancement of Women. And that was in 1973.

Jordan: But before that, she was the first woman ever elected to the American Academy of Arts and Sciences. And in 1850, she and entomologist Maria Morris were the first women elected into the American Association for the Advancement of Science. So true pioneers.

Kit: Mhm. So for a period of time, she worked tracking the motions of planets to aid sailors in navigation for the US Coast Survey, sort of building on that work she did with her father. But ultimately she ended up being the very first person appointed to the faculty at the newly founded Vassar College.

Jordan: She was a professor of astronomy despite not having a college degree herself, and ran the Vassar College Observatory for more than 20 years.

Kit: She was said to be a teacher that engaged her students in active learning and engaged them in field work. And in this capacity,

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Kit: she did research on a wide range of topics, from nebulae to binary stars to solar eclipses. And then what she started to do, which is another sort of claim to fame, was she began taking daily photographs of the sun and sunspots and was able to show that sunspots were not in fact, clouds on the sun as previously thought.

Jordan: Truly a pioneering astronomer and astrophotographer.

Kit: Yeah, she she was really prolific, and so she died in 1889. She now has an observatory named after her, um, on Nantucket, and it's run by the Maria Mitchell

Association. She also has a crater named after her on the Moon. And she's sometimes colloquially known as America's first woman astronomer. And as I mentioned, I'll post over on our socials for anyone who want to learn more about her and her work.

Science of Sunspots

Jordan: So Maria Mitchell had a lot of achievements, but let's talk a little bit more about sunspots, Kit.

Kit: In our episode on the science and folklore of aurora, we talked about how solar activity causes aurora. But solar flares and coronal mass ejections are also linked to sunspots, since these areas tend to be the areas of the sun that are very active.

Jordan: When you see images of the sun, you can sometimes see spots that are darker than the surrounding area. And sunspots are comprised of this dark area, which is called an umbra, and a slightly lighter but still darker than the rest of the surface, called the penumbra. These areas appear darker because they're actually cooler than the surrounding material.

Kit: The photosphere of the sun, which is one of the outer layers where sunspots appear, is about 10,000 degrees Fahrenheit, while an average umbra, that sort of darker spot, is closer to around 6,300 degrees Fahrenheit.

Jordan: Oh, ice station cool. A nice chilly 6,000 degrees. Though, to be fair, the inner parts of the sun, like the convective zone, they can be around 3.6 million degrees. Suddenly, this 6,000 degrees is sounding like a nice ice bath. And as for the core of the

sun itself, yeah, now we're talking 27 million degrees. 6,000 degrees is going to start feeling like absolute zero. Hot.

Kit: Very, very hot. Hot, hot, hot. And yet the sun is actually kind of in the middle of the pack in terms of temperature as a yellow main sequence star, as we've discussed before on the pod.

Jordan: So, yeah, if 27 million degrees at the Sun's core isn't hot enough for you, you know, there are other suns out there. But these cooler, relatively speaking, regions of the sun are caused by the magnetic fields around the Sun. Like all stars, the sun is primarily made up of flowing, moving plasma, which creates magnetic fields. This system or process, which is driven by the heat of nuclear fusion, is known as solar dynamo.

Kit: Solar dynamo would be a great, great band name.

Jordan: Great marvel superhero name. Yeah, Sidekick. Solar dynamo. Come through.

Kit: Yeah, they should have just called the Human Torch Solar Dynamo. That's my take. Anyway, as the sun's magnetic field is shifting and flowing. Sometimes the fields get tangled or snarled, as I saw it described on a NASA website. Tangled and snarled magnetic fields. And what happens when they get tangled is that there's an increase in magnetic pressure and a decrease in atmosphere pressure, which then drops the temperature of the area.

Jordan: And that's where we get those dark spots which kind of look tiny, but can be anywhere from 10 miles to 100,000 miles across. Most of them are between about

1,000 and 100,000 miles across.

Kit: Yeah. So some of those little spots that you see when you see astrophotography of the sun could be larger across than the entire Earth.

Jordan: Sunspots can last days to month. And the number of sunspots cycles on an 11 year basis, with some periods in this time having more or fewer spots.

Kit: NASA tracks and reports on sunspot activities, and they do so in part because these sunspots are associated with space weather.

Jordan: Right. And like we discussed in our aurora episode, these conditions in space of course impact things that we use here on Earth. Gps, power grids, radio, satellite communication.

Kit: Of course, we also need to know when those aurora borealis and aurora australis are on their way as well.

Jordan: That's the most important thing to me personally. Yes. When do I get to see the cool stuff? And to learn more about those. The cool stuff, as I called it, check out our back catalog.

Outro

Thank you all for joining us today on our asterism about Maria Mitchell and sunspots.

Kit: This has been Kit

Jordan: and Jordan.

Kit: Sisters who love stars and stories.

Jordan: And we'll see you next time

Kit: on Starry Time

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