Asterism: Auroras

Intro

Jordan: [Music]

Jordan: [Music] Hi, I'm Jordan.

Kit: And I'm Kit.

Jordan: Welcome to Starry Time

Kit: Asterisms Edition,

Jordan: where stars plus lines equal stories

Kit: with an asterisk.

Jordan: In these episodes, we'll explore ideas, concepts, or people that didn't make it into the main show or that we just want to talk about a little bit more.

Kit: This episode also marks our very last episode of season two.

Jordan: Quests and Curses!

Kit: Yes, very exciting. Uh, we've already started planning season three, but we're going

to take a break before launching that next season.

Jordan: So be sure to follow us on our socials at Starrytimepod on the Universeodon server, on Mastodon, and on Twitter, Tumblr, and YouTube to keep up to date with all things Starry Time.

Kit: In today's episode, we're going to be talking about Aurora, which include Aurora Borealis.

Jordan: The Northern Lights,

Kit: and Aurora Australis,

Jordan: the Southern Lights.

Kit: This astronomical phenomenon of Aurora and Aurora Borealis and Aurora Australis actually have nothing to do with the constellations Corona Borealis or Corona Australis.

Jordan: Just similar names, which, not confusing at all, really.

Kit: Yeah. No one's confused.

Jordan: No one at all. In today's episode, we'll discuss what Aurorae are and where to find them and dip a toe into some of the myths and folklore surrounding these beautiful light shows.

The Science of Auroras

Kit: So, first things first, NASA describes aurora as, and I quote, "a natural display of light in the night sky."

Jordan: These displays, as NASA calls them, are actually quite stunning. They've been described in various places as bright ribbons across the sky or as curtains or spirals of arcs of light. And that's what they look like. Swirls of blue, swirls of green and red, and occasionally, if you're lucky, pink and yellow as well.

Kit: And those colors are a reflection of the processes that create auroras, which is basically the result of solar wind interacting with our magnetosphere.

Jordan: All right, so let's break that down a little bit. At all times, our sun is emitting solar winds into the solar system, but most of the time, the magnetic field around the earth protects us, and no light shows. We don't really see anything happening.

Kit: Yes. So the magnetic field around Earth, which is called the magnetosphere, is generated from the molten iron core of our planet. And it's actually not a circular field around us. It's actually more of a comet shape. So the side facing the sun, which is also called the day side, extends six to ten times the radius of the Earth outward, sort of like a bubble. But the back, the part facing away from the sun, has what's called a magnetotail.

Jordan: Magnetotail. I like that.

Kit: Yeah, magnetotail. And that tail sort of trailing behind us, um, changes in length, but

is usually on the order of 100 Earth radii. The shape of the magnetosphere is also important because at very high latitudes, like our poles, the north and south pole, the field is distorted and compressed due to the effects with the solar winds. What ends up happening is that the magnetosphere is sort of pinched around the poles before extending into the tail.

Jordan: Thankfully, this magnetosphere is what protects us both from solar wind, but also our least favorite types of radiation, solar and cosmic.

Kit: Yeah, and as you mentioned before, this is happening all the time. Solar winds coming, cosmic radiation, lots of things are sort of flying about, and our beautiful magnetosphere protects us, and we don't see aurora. But sometimes our sun is, it's, ah, churning, burning,

Jordan: Churning and burning. That's our sun, all right.

Kit: it's churnin', burnin' . And it has its own magnetic field gymnastics that are happening on the surface. And as a result of what's happening on the surface of the sun and throughout the different layers of the sun, sometimes we have these big solar storms that create coronal mass ejections and solar flares.

Jordan: As a reminder, both coronal mass ejections and solar flares are caused by the magnetic dynamics and realignment in the sun. But coronal mass ejections are big, electrified plasma bubbles, whereas solar flares are more like bursts of electromagnetic radiation.

Kit: And when this energy comes our way, the

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Kit: magnetosphere deflects some of these charged particles. But when they're coming en masse like this, not all of them can be, sort of, deflected.

Jordan: Can't catch them all.

Kit: Exactly. So some of this material travels along the magnetic fields around the earth and starts smashing into the gases in our atmosphere.

Jordan: And this is what explains why we have Aurora Borealis and Aurora Australis and why this phenomenon tends to happen towards the poles because of the compression of the magnetic field in those areas.

Kit: Exactly. And this also explains why we have different colors. So these particles that are smashing into our atmosphere, when they hit red, we're talking about very excited oxygen at high altitudes. When we see green, it's excited oxygen at lower altitudes, and then we see nitrogen that turns blue and purple.

Jordan: In our off season, I'm going to do a lot of research into excited oxygen. [laughter] Other colors, such as yellow and pink, can show up as a mix of green and blue. But, all right, Kit, now, we know what causes these Aurora, but I remember earlier this summer, there was a lot of talk about folks being able to see auroras pretty far south, like in Michigan and Pennsylvania, but also as far south as Florida. So how do astronomers know when and where we're going to see these auroras?

Kit: The recent, and just to date us, we're talking about spring and summer 2024. So

this recent news about aurora was caused by a massive solar storm that was 15 or 16 times the size of the earth, which, uh, just for comparison's sake, usually the storms that are happening, the typical storms that are happening on the sun are one to three times the size of the earth. So these recent aurora that we've been able to see really far south are the result of this huge, huge, huge storm.

Jordan: Big, big storm, everybody. That's why you got a sneak peek at the lights. But basically, these events produce more than typical particles, which in turn end up further south from the magnetic poles. Is that correct?

Kit: Yeah, exactly. So it extends what they call the auroral oval.

Jordan: Oh . The bigger the storm, the bigger the aurora oval.

Kit: Say that five times fast.

Jordan: The bigger the storm, the bigger the auroral oval [laughter] Rural juror,

Kit: rural juror! [laughter]

Jordan: Auroral oval. And I did read that on rare occasions during very, very big storms, I guess, the Aurora Borealis has been seen in southern U.S. states as Texas and Florida and in the Mediterranean. And the Aurora Australis has been seen as far north as Uruguay, almost at the equator.

Kit: Mhm. More typically, though, as we mentioned, they're in Arctic areas, so far north and Antarctic, far south latitudes. Just because, again, as we mentioned before, of the

location of the magnetic poles of the earth.

Jordan: That makes sense.

Kit: So how do we know when they're going to happen? I think is still a really good question. We know when they're going to happen because scientists are watching the sun for solar storms that might create these kinds of events.

Jordan: Ah. They're on Aurora watch at all times because they love auroras. Right? That's got to be it.

Kit: I'm sure that they do love aurora but it's also because these kinds of solar storms can have impacts on GPS, power grids, radio signals, satellites. There was a flare in 1989 that caused a nine hour electric outage in Quebec.

Jordan: So you're not saying it's just because they're big, big fans, huh? All right, this can get pretty serious.

Kit: So it's probably not surprising to know that we've definitely got eyes on the sun. I mean, not literally.

Jordan: Yeah. I mean, you'll go blind, but.

Kit: Right. Don't, don't look at the sun. In fact, NOAA, which stands for the National Oceanic and Atmospheric Administration has a space weather prediction center, a website where you can find out current space weather conditions and aurora forecast. So I'll definitely be sure to put that into our social so you can take a look at it. [Music]

Myths and Folklore of Auroras

Jordan: Kit, I think we did a great job of breaking down the science of aurora. So let's talk a little bit about the myths and folklore that have surrounded this phenomenon. First things first, let's talk about these names. The term Aurora Borealis comes by way of Galileo, who was drawing inspiration from Greco- Roman mythology. Aurora is the god of dawn, Boreas is the god of the north wind, and Auster is the god of the southern wind.

Kit: But the ancient Greeks themselves don't really have a myth about aurora.

Jordan: Which kind of makes sense, because unless it was 15 to 16 times larger

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Jordan: than the average solar storm, it's unlikely that they'd be able to see aurora at their latitude.

Kit: Exactly. It wouldn't be common enough for them to necessarily build a myth around.

Jordan: By contrast, Vikings and other Nordic groups, as well as Indigenous peoples in the far north and south, have a number of beliefs and myths about aurora.

Kit: Yeah. And so here we're seeing that classic use of a myth in folklore to explain the natural world, something we've talked about time and time again on this podcast.

Jordan: So in Norse mythology, they believed that aurora were lights reflecting off the

shields of Valkyries sent by Odin.

Kit: And, of course, Valkyries were women warriors that ferried worthy warriors to Valhalla, which was sort of the warrior's heaven in Norse mythology. And Odin was the sort of big daddy god of Norse mythology who, again, ruled over Valhalla.

Jordan: And if you thought Zeus left, uh, a little bit to be desired, Odin himself has quite a few foibles. However, in Nordic myth, aurora were also associated with the Bifrost Bridge, which some of us are familiar with from Marvel Comics or the Thor movies. And it's a part of Norse mythology that connects earth, Midgard, to Asgard, the place where gods live.

Kit: Yeah, I really liked this myth, and we haven't really talked a lot about Nordic or Norse mythology at all on the pod, so it's been kind of fun to learn a little bit more about that. Another origin story of the aurora comes from Finland, where the Aurora Borealis are called revontulet.

Jordan: Ravon to let.

Kit: Ravon- to- let. I don't know if that's right.

Jordan: Have either of us ever worked on our Finnish? Because I'm not even sure I think I went with a French or something entirely wrong. But yes, what does revontulet translate to?

Kit: So it actually translates to fire fox. And the story here is that the aurora are created by Arctic Foxes that run so fast across the sky that they create sparks.

Jordan: I love this myth. I mean, is it any relation to Firefox, the browser or what?

Kit: Sadly, no. But I did see pictures of Arctic Foxes while I was doing research about this, and wow. They are very cute.

Jordan: Cute! Staying in this part of the world. In Iceland, it was said that the northern lights could relieve childbearing pain, if only. And Sweden, they were thought to be a sign of good news, a harbinger of a good harvest in the coming year.

Kit: Meanwhile, among some Cree People, aurora were thought of as the spirits of loved ones reaching out. While some Algonquin Peoples thought of the aurora as a fire lit by their cultural hero to remind them that he was watching over them as he moved north, creating the world.

Jordan: Sometimes people saw aurora as a warning or something more ominous. For example, the Fox or Meskwaki people are said to have seen aurora as restless spirits seeking vengeance.

Kit: Overall, there just seems to be so much diversity and meaning behind these lights in the night sky across time, place, and people. So instead of trying to detail them all here, I will definitely post some sources with additional myths for folks to check out on our socials, which you should be following since we're going to take a quick break before season three. So at StarryTimePod on the Universeodon server and Twitter and Tumblr and YouTube. Click that automatic download button on your favorite podcast streaming platform so you don't miss our episodes when we come back.

Jordan: That sounds great, Kit.

Outro

Kit: Thank you all for joining us today for the final episode of season two.

Jordan: Quests and curses. We have our slate of constellations selected, and we're super excited for season three. So give us a little bit of a head start and we'll be back with more weekly astronomy, mythology, and constellation content for you all real, real soon. [Music]

Kit: This has been Kit

Jordan: And Jordan.

Kit: Sisters, lovers of stars and stories.

Jordan: And we'll see you next season

Kit: On Starry Time. [Music]

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