

## AirSpace Season 1, Episode 20

### When You Wish Upon a Star

Matt:

I wonder if dogs can see stars. Do you think dogs can see stars?

Nick:

That's a whole other episode.

Matt:

Or meteors as they come in? Do they even look at the sky?

Emily:

They howl at moons.

Matt:

I don't know.

Nick:

Today's episode of Airspace.. meteor showers. We're your hosts. I'm Nick.

Emily:

I'm Emily.

Matt:

And I'm Matt.

Emily:

What's the best meteor shower you guys have seen?

Matt:

Ah, I can't remember what year this was or what meteor shower, but I remember my wife, Jeanette and I drove out into the desert from San Diego, like down the 8. And we found a sort of scenic overlook to stop at. And we laid on the ground at the scenic overlook and watched the meteor shower for about, I don't know, an hour or so. It was pretty incredible.

Nick:

I don't generally turn up for meteor showers. I'm the guy that RSVPs, but then skips the party. I like if...I'm..

Emily:

You didn't get anything off the registry?

Nick:

No, if I'm going to go outside in the middle of the night, I like my astronomical phenomenon to have like a to the second predetermined schedule. So it's eclipse or nothing.

Emily:

It's eclipse or nothing.

Nick:

So I thought meteor showers were a summer thing or is that wishful thinking?

Emily:

It's wishful thinking because normally when you want to go see a meteor shower, it's usually in the middle of the night and it's usually very, very cold outside. So you never want to get out of bed to go watch it.

Matt:

But you can bring your blanket with you...

Nick:

And Irish coffee.

Emily:

And hot water bottle. And wool slippers.

Matt:

Someone to cuddle with ...if you know what I mean

Emily:

So it's....

Nick:

Like your dog, Luke?

Matt:

Yeah. Exactly. A nice warm dog. #catahoulas

Emily:

I always think Matt's dogs look like baby seals, especially the images he posted this weekend of them sitting in front of the space heater. Should we put them on Instagram?

Matt:

Yeah. Yeah, we can do that. I don't think they'll mind.

Nick:

At Airspace podcast... like the kids say?

Emily:

Yeah, like the kids say.

Nick:

On Instagram.

Emily:

So it turns out that every season typically has at least one meteor shower kind of associated with it. We just associate the summer with them because that's the season where you actually want to go outside and watch a meteor shower, but they all kind of occur on really predictable intervals.

Matt:

Right. They are a regular sort of solar system phenomenon.

Emily:

So there's nine major showers each year.

Nick:

Is it solar system junk? Is it material hitting earth or is it the earth hitting stuff?

Matt:

A little bit of both.

Emily:

You want me to drop some knowledge?

Matt:

Yeah. Go for it. Emily.

Emily:

So the earth is on a predictable orbit. We know what it is around the sun, right? It takes 365 days for that to happen. Well, comets also orbit the sun, but they don't have those really beautiful circular orbits that we associate planets with.

There are these moments where you have a comet that comes in close to the sun, and since comets are made mostly out of ice, they'll actually start to break up and melt. And when that comet's orbit intersects Earth's orbit, there's this moment where there's kind of this debris leftover. And because comets are on a predictable periodic orbit, as are we, there's these moments in time where we know we're going to interact with that debris that's left over from the comet making its close pass by the sun.

So we're not actually interacting with stars. We're interacting with little bits of grains of sand and dust. And that's what burns up in our atmosphere when we kind of plow through the cloud.

Nick:

Well, comet tails, that's still, you know, it's not shooting stars...

Emily:

It's not shooting stars, but we're plowing through comet tails.

Matt:

That's still, a little poetic. Yeah. Yeah.

Nick:

So by and large shooting stars that don't make it to the ground are not the size of basketballs, right?

Matt:

Yeah. How big are these fragments that get into our atmosphere?

Nick:

How big aren't they?

Emily:

Well, I mean, you're talking Tic Tacs, grains of sand...

Nick:

Something Tic Tac size is generating that level of light.

Matt:

Yeah. Meteors are pretty astounding when you really consider their size.

Emily:

But this brings up a really good point. The difference between a meteorite, a meteoroid and a meteor, because those are three different things.

Nick:

Does a meteorite reach the ground?

Emily:

A meteorite reaches the ground. So something that's marble size will probably burn up and look like a shooting star. And it's never going to plunk down on the earth. But if it does make it to the earth, that's a meteorite.

Nick:

My astronomy professor in college found a meteorite in a field near his house when he was a very small child. And that's why he went into astronomy. He brings it in, he brings it in at the beginning of every class. It's like his origin story.

Emily:

So a meteorite's what hits the ground, a meteor are those sand size Tic Tac size things that don't ever make it to the ground. They just burn up in the atmosphere, making your shooting star. And then the meteoroid, that's essentially the stuff up in space that we could collide with.

Nick:

Oh, so really it's, it's more about their relationship to us. That's very, that's very centric of us. And why, why can we see something the size of a Tic Tac? I can't see a Tic Tac from 25 miles away, generally speaking.

Matt:

Right, so.. how hot do the things get when they are burning up in our atmosphere?

Emily:

It gets so hot that instead of just burning into kind of ash, it actually vaporizes into a gas, and that's why it creates this big ball of fiery-ness.

Nick:

Is that the same plasma reaction that you see on spacecraft reentering? There's a very famous photo of Apollo 8 that looks like, well, it looks like a shooting star, but it's huge.

Emily:

It's the exact same effect where there's enough friction. As the thing is moving through the atmosphere, it gets hot enough. You know, the whole like rubbing your hands together situation?

Nick:

Which you do a lot if you're sitting out in the middle of December in the middle of the night looking for meteors.

Matt:

That's right.

Emily:

The Geminids is a meteor shower that peaks in December, and Matt and I actually went outside to see if we could see any meteors.

Nick:

Wait, you guys went together?

Emily:

No.

Matt:

No. In our respective homes.

Nick:

I was going to be like, I, cause I didn't, I wasn't there.

Emily:

You were going to feel a little left out..

Nick:

Of the party that I just sat out.

Matt:

Cause you said you weren't coming. We made sure to record it so that we could, you know, show you what we got up to.

Emily:

So this is Emily. It is, I'm going to say the 13th of December. It's a Thursday. I've been at a meeting all week, and it's, oh gosh, it's almost 9 o'clock. I haven't made it to bed all week before midnight. So I was kind of expecting to be able to come out and try and see the Geminids sometime closer to peak. There goes the bus. They're supposed to peak sometime around 2:00 AM, but you should, on the night of a meteor shower, you should be able to come out earlier than midnight and be able to see a couple of meteorites. So that's what we're doing.

We're in Washington DC. I'm going to go ahead and say, it's even cloudier tonight than it was last night. I can't even see a star. Normally on my walk home, I can see some airplanes, definitely the big dipper. I can always see the big dipper, and I can't see the big dipper. I can't see the Crescent moon, which is kind of a drag. So it doesn't bode well. I'm kind of glad it's not 2:00 AM. Cause I'd be pretty bummed out if I woke up at 2:00 AM and went outside in my slippers.

Matt:

It's 2:00 AM on the morning of December 14th and the overcast that was blocking my view before seems to be mostly gone. It is a beautiful night out here on the patio. I am looking up through the trees. All I see are stars, no shooting stars. Oh, there was one. I think. It's hard to tell. Could've just been my imagination. What I'm hoping is that I haven't just gotten older and with poorer eyesight, I'm now unable to see this type of phenomenon. At least I saw it when I was younger.

Nick:

Matt having an existential crisis in the dark, on the street.

Matt:

No I was on my porch.

Nick:

On your porch. Yeah. I won't say because it sounds mean, "hey, I'm glad I didn't try that," but I will say that shooting stars feel like one of those things that's better in the wild, like serendipitously. Like if you see a shooting star, that's really special and you make a wish and everything, but if you get out of bed at

two o'clock in the morning on a work night to go out and look for them, is it quite that... is it quite as engaging, quite as special?

Emily:

It can be, yeah.

Matt:

Yeah, the time that I went out of my way and left the city and went to the darkest spot with no lights, no nothing... and watched it for an hour, you know, a large meteor shower for an hour. It never stops being fascinating.

Emily:

Like that was just as cool?

Matt:

The longer you watch, the better it gets. I mean, it's really just incredible when you really see one.

Nick:

All of the meteor showers that we know about are named after the area of the sky that they come from, which is called the radiant. You talk about really great vocabulary. So like the Geminids, it seemed to emanate, seemed to radiate from Gemini, and the Perseids seem to emanate from Perseus.

Emily:

If you're thinking about Zodiac signs, we're talking about the same Gemini. Gemini is a constellation in the sky.

Nick:

So do meteor showers have like horoscopes?

Emily:

No, there's no... they're actually more predictable than your horoscope.

Nick:

So where did wishing on a star come from? Was that, was that Jiminy Cricket original?

Matt:

You know, I'm not exactly sure where that comes from, but meteor showers are one of those things that were very mysterious for a long time. You know, why were they happening? What significance did they have? Did it mean that something was about to happen on earth, some tragedy or some good omen? There was all kinds of theories about what meteor showers might mean.

Emily:

According to the internet, which obviously makes it true. Ptolemy, who is an ancient astronomer. Nick, do we know how old Ptolemy is?

Matt:

He's dead.

Nick:

45, 50

Emily:

You're killing me. No. Like how long ago was he...?

Matt:

So if you think about, you know, the Copernican Revolution that told us that the earth was not the center of the universe?

Emily:

Ptolemy was before Copernicus.

Matt:

The Ptolemaic system was the dominant system before Copernicus that put the earth in the center.

Emily:

And so his prediction had to do with the fact that shooting stars or these meteor showers are actually where there's sort of a rift in the sky that's kind of opening up between heaven and earth. And that happens when the gods were getting really curious about what us crazy humans were doing down on the ground, they would sort of rip the sky open so they could kind of look in on us. And that would knock some of the stars out of the sky, which is like the coolest way to think about a meteor shower.

Nick:

So it's like being on the roof and you're like near the edge and you're knocking sort of rocks off.

Emily:

Yeah.

Nick:

Wow. That is ..

Emily:

So, since the internet said that was true.

Nick:

That is really big, but also somehow really mundane from a God perspective.

Matt:



This is probably going too much in the weeds, but like Ptolemy and Aristotle, like their view of the heavens was essentially that the heavens were made of very different stuff than what the earth and the atmosphere were made of. So anytime that those two things seem to interact, like that was kind of a important and special thing.

Emily:

So when the gods kind of rip open the sky and sort of knock some of these stars down, that's the moment when the gods can hear you. And so you have to make a wish really, really quickly because there's that sort of split second, where they've ripped a hole in the sky, that they can actually hear you and try and grant those wishes for you. So that's supposed to be the origin of this, making a wish on a shooting star.

Nick:

It's like catching your boss in his office. And like everybody's shouting what they need to him all at the same time.

If like me, you did not make it out for the Geminids, there's a couple of other opportunities coming up. The Ursids are December 22nd, the 23rd, and the Quadrantids are January 3rd and 4th, which is the first meteor shower of 2019.

Matt:

If you're trying to view a meteor shower, getting up after midnight is actually one of the best strategies... sometime like in the darkest later part of the night. If you think about noon, that's the point where your part of the earth is facing directly at the sun. And if you think about midnight, that's where you're facing directly away from the sun. But if you go then just a few hours past midnight, suddenly you're turning toward that space between away from the sun and toward the sun. You're just sort of facing into the Earth's orbital path.

Nick:

So you're facing the swarm. You're facing the shower.

Matt:

You're facing the part where it's basically where the collisions are happening. Yeah.

Emily:

Sometimes these things are good enough that you can see them in the city with bright lights and you can still have an opportunity to see shooting stars.

Nick:

Okay. I'll give it a few minutes.

Matt:

Your best bet really is to go somewhere with no light pollution and a clear sky. Like, you know, a campground that's out far away from the city.

Nick:

Matt's always trying to get us to come to the suburbs.

Matt:

Yeah.

Nick:

That's it for this episode of Airspace. We'll be back in the new year. Airspace is produced by Katie Moyer, Lizzie Peabody and Jocelyn Frank. Mix by Tarek Fouda. Special thanks to Jason Orfanon, Genevieve Sponsler and John Barth. This episode was supported by PRX and the Alfred P Sloan Foundation, enhancing public understanding of science, technology, and economic performance. More information at [sloan.org](http://sloan.org).

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