

Episode 21: Tiny Specks of Fun

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- Pamela: Welcome to yet another episode of Slacker Astronomy; a podcast about astronomy and just about anything else that floats over our heads.
- Travis: Every week or so we bring you a recent news event from the world of astronomy. And when there is nothing new to report we do something self destructive, like draw dead people on the walls with crayons.
- Pamela: So thanks for listening, and keeping us from giving into our psychosis.
- Travis: On August 12 the Perseid meteor shower reached its annual peak. Known as the Old Faithful of meteor showers, the Perseids are a good show year in and year out when viewed from dark skies.
- Pamela: Dark like a romantically lit candlelight dinner?
- Travis: No, dark like the soul of Cardinal Law.
- Pamela: Oh, you mean pitch black.
- Travis: Can't get any darker.
- Pamela: The West Texas skies could get that dark if the **stars** weren't so darn bright.
- Travis: The West Texas skies would be a perfect place to watch a meteor shower. But you don't need to go somewhere that dark. Just get away from the city by about 30 minutes or so. Meteors are usually faint to the naked eye and bright lights from the city can obscure them.
- Pamela: That we can see them at all is impressive considering their size and origin. Most meteors are only the size of a grain of dust and date back to the birth of the solar system over 4 billion years ago. But when travelling at 60 kilometers per second, even a geriatric grain of dust can pack quite a wallop.
- Travis: The meteors in a meteor shower begin as part of a comet. Long-period comets, with orbital periods of more than 200 years, start from out in the Oort cloud, a region far beyond Pluto or even the 10th planet where leftovers from the formation of our solar system are kept. It is cold, dark and no one is quite sure exactly what is there. It's pretty similar to the stuff found in the back of Pamela's refrigerator.
- Pamela: Except there is no life in the Oort cloud. Whereas in the fridge... yeah... the scientists are still sorting that out . . .
- Travis: Short period comets, like Halley's comet, probably come from the Kuiper Belt, where Pluto, the 10th planet and Sedna all happily herd a flock of 1000s of small ice balls.
- Pamela: These pre-born comets are made of water ice, frozen gases, carbon dust, silicates, and metals.

Travis: Occasionally one of these giant, dirty snowballs stumbles into the inner solar system. As a comet falls toward the Sun, it heats up, melting and expelling the frozen gases and water from the comet. The solar wind then sweeps these melted materials into the beautiful tails we see.

Pamela: Those tails are quite dirty. The expelled material carries with it lots of cometary dust. This is easily seen in infrared images of the comet, some of which we'll put in the show notes at slackerastronomy.org.

Travis: So these comets come hurtling through our solar system like teenagers out for a joy ride. Along the way they are throwing out gas and dust, generally trailing dust and grime through the inner solar system.

Pamela: Most comets have fairly stable elliptical shaped orbits, and they sweep past the Sun on roughly the same path century after century, leaving a growing trail of debris as they go.

Travis: Think about the trail you leave across the carpet from your front door to where ever you sit to take off your shoes.

Pamela: The comets that create meteor showers, for better or worse, leave their trail of dirt right across the Earth's orbital path.

Travis: And occasionally the Earth whacks right into one of these paths.

Pamela: Like on August 12, when the Earth whacked into the trail left by the comet 109P/Swift-Tuttle.

Travis: As the Earth moves through the comet's trail of dust, many of the particles in the trail crash into our atmosphere at relative speeds of up to tens of kilometers per second. As they reach roughly 100 kilometers above the Earth they begin to heat up in the atmosphere. At first a shock front is formed in front of the meteor. This begins to glow as the meteor ionizes atoms in the atmosphere, releasing light.

Pamela: If the meteor is heading into the atmosphere at a shallow angle, then it can survive long enough to form a trail, not to be confused with a *tail*.

Travis: Why?

Pamela: Because tails on objects usually belong to the object itself while a trail belongs to something else that object affected somehow. This trail of light behind the meteor is a stream of ionized plasma, left over from the intense ionization triggered by the meteor.

Travis: The glowing trail usually only lasts a second or two but can sometimes last for minutes when associated with abnormally large meteors.

Pamela: Radio waves can be bounced off these trails. Amateur radio operators use meteor showers to practice a technique called meteor scatter where they bounce VHF radio messages over the horizon. You can listen to this phenomenon at home with any radio or television hooked up to an old fashioned antenna.

Travis: Antenna? Is that the black thing from my TV to the wall?

Pamela: No that is your cable cord. The antenna looks like bunny ears on a TV.

Travis: Oh the Playboy channel!

Pamela: No, on *TOP* of the TV. Before there was cable or satellite, people used antennae to watch TV.

Travis: Oh, those things sticking out of the heads of the teletubbies.

Pamela: That's right. What you want to do is wait for the next meteor shower. Then tune your TV or radio to a channel that you normally cannot hear such as a TV or radio channel in a nearby city. For example, here in Boston we don't have Channel 3 on TV. But Hartford, Connecticut, about 50 miles away does. Normally we can't watch channel 3 in Hartford because it is too far. But during meteor showers, we can, if just for a second.

Travis: So tune your radio or TV to that channel and wait. When a meteor passes overhead the transmitter energy will be bounced your way. It will sound something like a sonar ping. Here is an example from a recording Aaron made of the Eta Aquarids meteor shower in May of 2000.

(sound)

Travis: Here it is again

(sound)

Pamela: We'll link to that in the show notes so you can listen more closely. Some people say they can actually make out audio from the TV or radio station when an abnormally bright meteor passes overhead, but we at Slacker Astronomy haven't been able to do that yet.

Travis: This is a neat technique to count meteors since it can be done from the city, under clouds, in a Full Moon and even in the daytime. Yes, there are meteors in the daytime too. Much of what we know about meteor showers comes from monitoring them via radio.

Pamela: Another way to monitor a shower is to count them the old fashioned way by using the Mark I Eyeball. But even there scientists have tried their best to take the fun out of it. Those who count meteors take it very seriously. They make note of the direction of the meteor, the brightness, how long the trail was, where it was in the sky and most importantly - when it occurred, down to the second.

Travis: A serious meteor observer will stay out all night counting meteors into a tape recorder. You don't want to use a pen and paper because while writing you may miss another meteor! They will also be listening to the WWV shortwave station in the background, so that they will know exactly when it was seen.

Pamela: These careful studies allow us to better predict future meteor showers. It's also yet another area of astronomy where amateurs can contribute to real science.

Travis: But if you don't want to get serious, you can always just go outside and watch them with your naked eye and a group of friends. Here are some tips to enjoying a meteor shower. First, dark skies are important. If there is a bright Moon, forget it. And if you live in the city, spend the gas money to get to a rural site.

Pamela: Also, prepare to stay up late — Bring plenty of coffee, soda and junk food. This is a great excuse to trash your diet. Bring a reclining lawn chair and/or a sleeping bag. Do not bring a regular chair because you need to lean your head on something.

Travis: Then comes the hard part: Just look up. That's it. Just look up at the sky and wait. Meteors can come from anywhere in the sky, but the best place to look is slightly off center of zenith. In other words, don't look straight up, but slightly to the side. Any side. And be patient.

Pamela: Meteor shower predictions come with something called ZHR - zenith hourly rate. This is a prediction of the number of meteors you might see in an hour in a perfect observing location. You will almost never be in a perfect location so don't expect to see exactly what they predict. But it should be close.

Travis: Stay up as late as possible. Meteor showers peak between midnight and dawn because that is when your area of the planet is facing head-on into the storm. So we are running into the stream at an angle that picks up the most dust.

Pamela: Also, meteors are not uniformly distributed. They can come bunched up. So while a prediction may call for 60 meteors per hour, or one per minute, you may go 10 minutes without seeing one single meteor and then see 10 in just a couple of minutes.

Travis: Again, patience is the key.

Pamela: Slacker Astronomy highly recommends watching meteor showers with friends. It makes the time fly by since you can chat and gossip. Also, you get to hear their excitement, like in this recording from the 2001 Leonids:

(recording of screaming)

Travis: We also recommend bringing your iPod loaded with Slacker Astronomy episodes.

Pamela: No! Our show would bore them to sleep during the meteor shower!

Travis: Oh yeah. Try Universe Today, Skepticity, the Lolife podcast, or some of the other science shows out there instead. Save us for the late afternoon recovery nap in the office the next day.

Pamela: There are lots of meteor showers throughout the year. The Geminids are a Slacker Astronomy favorite because they are very fast, and thus very bright. But they are short and don't often leave a trail because they burn out so fast. They are also in December, during the winter for the northern hemisphere.

Travis: The only thing colder than the Geminids in Boston is the judge who granted my ex girlfriend that restraining order.

Pamela: The Leonids are in November and have been spectacular lately because their parent comet recently passed by the Earth and replenished the dirt trail. A list of the annual meteor showers is linked from the show notes.

Travis: Meteor showers are named after the constellation that the meteors seem to come from. This is called the radiant, and it marks the place where the Earth is wacking the dirt trail.

Pamela: With the Perseids, for example, all of the meteors seem to be fleeing from the constellation Perseus, the Hero. They don't really come from Perseus, this is just an optical illusion but it makes for an easy naming scheme.

Travis: Beats calling the it "Meteor Shower UB313 dash 2005CD".

Pamela: You know somewhere, some astronomer is secretly scheming to come up with just such a naming system.

Travis: And when they do, Slacker Astronomy will be ready to explain it to you.

Pamela: Aaron and I recently attempted to watch last week's Perseid shower. We were only a little bit successful, but we did make a sound seeing tour out of it, which we posted on the SA-Extra feed. Subscribe to the feed via our web site or just download the MP3 from the home page.

Travis: Thanks for listening to yet another episode of Slacker Astronomy. Send feedback and insider trading tips to info@slackerastronomy.org. On behalf of Pamela and our author Aaron, this is Travis Searle.

Pamela: This has been Slacker Astronomy; a podcast for you, for fun, for the voices in our heads.