ASTRONOMY BEHIND THE HEADLINES
A podcast for Informal Science Educators
from the Astronomical Society of the Pacific
www.astrosociety.org/abh

Episode 2: COSMIC DEBRIS
with guest Dr. Peter Jenniskens of the SETI Institute

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NARRATOR: Welcome to Astronomy Behind the Headlines, a podcast by the Astronomical Society of the Pacific.

Today we're going to explore those things that go "flash" in the night sky – and often are romantically called "shooting stars". In reality, of course, they're not stars but "meteors". Now, meteors are not part of our weather, as people used to think, but are usually caused by pieces of rock that arrive from space at incredibly high speeds and collide violently with the air. These *meteoroids* can be as small as a grain of sand all the way up to a good-sized boulder.

If you happen to be looking up when a shooting star moves across the sky, you'll see either a brief flash in the corner of your eye -- when the meteoroid is small -- or a glowing ball of fire arcing across the sky – if the meteoroid is big. If some of the meteoroid survives its rough ride and lands on the ground, it is then called a *meteorite.*

You've probably heard of meteor showers. That's the name that sky watchers give to meteors that seem to come from one point in the sky over the course of several hours or many days.

There are at least 64 known meteor showers. Many occur throughout the year, but some show up only periodically.

Starting in early July and lasting into August we can watch the *Perseid* meteor shower– named because all of its meteors seem to come from the constellation Perseus.

The *Leonids* occur in November and appear to radiate from the constellation Leo. And so it goes throughout the year – each season with its meteor showers.

This periodic appearance of meteor showers actually gives us a very good clue about where their *meteroids* come from. Meteor showers happen because Earth plows through streams of dust particles created by comets as they travel around the Sun.

Planetary scientists -- like Dr. Peter Jenniskens -- at the SETI Institute study these streams. Dr. Jenniskens wrote the book ***Meteor Showers and their Parent Comets,*** which is an encylopedia of information on meteor showers. It also contains lots of anecdotes from the nights he has spent looking for shooting stars. We spoke with him about his work.

Dr. Jenniskens, what makes these streams of comet dust so interesting?

PETER JENNISKENS: It's the irregular meteor showers are the most spectacular to watch. Until ten years ago they were more difficult to predict than the weather. At the time, we thought that would always be the case, but now we know how these showers come about. It turns out that these streams are always out there, just beyond Earth's orbit; sort of like watering a distant flower and the water of the garden hose, missing the flower. It is the gravity of Jupiter that moves the stream in and out of Earth's orbit, across the Earth's path. And once in

a while the Earth is hit by the stream. So, this is a way of finding out where those comets are.

Now some of these irregular showers are really interesting because they are the only evidence for a certain type of comets – comets that come only very rarely to the Sun – called long -period comets. This type can sneak up on us and if they hit us, they could send people the way of the dinosaurs.

Other showers are interesting because they are sort of the archeological remains of an nice comet but an object that is now dormant. I've been searching for these comets among the asteroids that are being discovered by astronomers. In 2003, I found the object that is responsible for the Quadrantid shower in January. This looks like an asteroid but 500 years ago, this was a comet. It lost a big chunk of matter which fell into dust. I discovered that this is how we get most of our meteor showers, including the alpha Capricornids, delta Aquariids, and the kappa Cygnids.

NARRATOR: In 2008, we all heard about an incoming chunk of space rock that impacted in North Africa. Tell us a little bit about this rock – where did it come from?

PETER JENNISKENS: This rock came from what we call a rare F-class asteroid, part of a family of asteroids in the asteroid belt between the planets Mars and Jupiter. F-class describes how these asteroids reflect sunlight.

This was the very first time that astronomers found an asteroid that was coming right at us. We got about 20 hours or so of warning time. Fortunately, this was a small one -- it was about four meters wide, but big enough for astronomers to measure how it reflected sunlight, determine what class it was, and also to measure how it tumbled around, and track it coming in.

It crashed in the Nubian Desert of northern Sudan. I traveled to Sudan as an outside expert at the invitation of Dr. Muawia Shaddad of the University of Khartoum and armed with this tracking data, and a busload of students from the University, we were able to recover some of the fragments that survived. This was the first time that material was recovered from an asteroid so frail that it exploded 37 kilometers high in the atmosphere. What the asteroid does is it breaks into pieces and creates a meteorite shower. This one was spread out over 29 kilometers, and over an area about several kilometers wide. So, it took us a while to recover this material in the desert. Only about five kilograms was recovered, and we think that 80,000 kilograms came in. Most of this asteroid exploded and went into dust.

Some of the recovered rocks were very porous and dark. Very interesting, because now for the first time we know what material these F-class asteroids are made of. It's a material that is called polymict ureilite. We pulled off a sample return mission to an asteroid on the cheap! This was an incredible adventure.

NARRATOR: It's important to remember that almost all meteors come from cometary dust particles. None of those make it to the ground intact – although there is a fair amount of *fine* comet dust that does not fully disintegrate. It settles down through our atmosphere all the time.

The large meteorites that DO make it to the ground are pieces of a single small asteroid that crashed into the atmosphere. It sent a shower of stones raining down to the ground.

Scientists are always anxious to get their hands on those chunks of space rock. This is because asteroids are fascinating pieces left over from the formation of the solar system. Just as comets tell astronomers a lot about the ices and gases that were present here some five billion years ago, the composition of asteroids

tells us about the rocky components of the solar system that eventually accreted together to form places like Mercury, Venus, Earth, and Mars.

You can find more information about meteor showers, meteoroids, asteroids, and comets at the Astronomical Society of the Pacific's *Astronomy Behind the Headlines* website: www.astrosociety.org/abh. Thanks for listening!

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