

Bluffer's Guide to Meteors

By Colin Johnston, Science Communicator

I have been giving you just enough details about various celestial objects to let you show them off to your friends and family. By now they must be convinced that you are an expert astronomer, perhaps you'll soon have your very own monthly TV show. Inevitably someone will come and tell you something like "Last night, all of a sudden I saw this light streak across the sky...what was it?"

What have they seen? Well, it wasn't a comet. Comets are lumps of stuff, mainly ice and rock, orbiting the Sun and are usually millions of kilometres from Earth. As the Sun's rays melt the surface ice, material can stream off a comet leaving a tail of gas and dust behind it. This tail can be millions of kilometres long and is clearly visible from Earth. Photographs of comets in the night sky can look as though they're depicting some white-hot fireball whizzing through the sky. However that impression is not accurate; space is big, comets are far away, so they move across the sky in months rather than seconds. Rather than a comet, what the witness saw was most likely a meteor.

"Most meteoroids are smaller than a grain of rice"

Meteors are the bright trails left by fragments of natural space debris called meteoroids (usually chunks of rock and iron) falling through the Earth's atmosphere. A typical meteoroid hits our atmosphere at about 72 000 km/h (compare this to the 29 500 km/h speed of a Space Shuttle Orbiter returning to Earth). Traveling through the air at this speed warms it up until it's white hot, leaving a trail of equally hot vapour behind (the posh name for this vapour is 'plasma'), so it ap-

pears as a bright streak in the sky. Most sources say that this warming is due to friction between the meteoroid and the Earth's atmosphere, and that is partially true. As the meteoroid zips through the atmosphere, air 'piles up' in front of it, and very simple physics shows that when air is compressed into a small volume it heats up. This 'ram-heating' is actually a larger contributor than friction and it's the main reason for objects such as satellites 'burning up on reentry'.

Most meteoroids are tiny, smaller than a grain of rice, and are quite common; if you watch the sky on a dark night you'll probably see several in an hour. Usually their arrival is completely random and unpredictable but some arrive in regular showers at particular times of the year. There is one coming up soon. Perhaps you could show it off? This is the Leonid meteor shower (call it the Leonids and you'll sound like a proper astronomer) and it peaks about 17-19 November. Where do meteors come from? They are essentially debris left over from the formation of the planets.

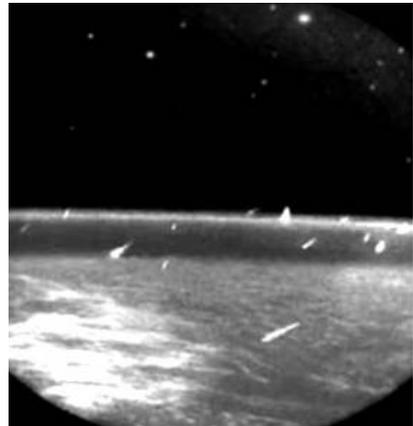


Image Credit: P. Jenniskens (NASA/Ames, SETI Inst.) et al., APL, UVISI, MSX, BMDO

Meteor shower from above During the peak of the 1997 Leonid Meteor Shower, a satellite called MSX imaged 29 meteors over a 48 minute period entering the Earth's atmosphere



Image Credit: Colin Johnston, Science Communicator

Million Dollar Meteorite This 635 kg meteorite is on display in Exploration Place, Kansas. Belonging to a rare class of meteorite called pallasites, it was discovered locally by Steve Arnold. US TV news shows claim it is worth \$1 million.

Some are the little bits of stuff which didn't end up as part of a planet and have wandered around the Solar System for billions of years until one lucky day their path crosses Earth's and zip! –that's the end of them. Others, including all those in the showers were once part of comets but escaped as the comets' icy surface was baked away by the Sun's rays.

Most meteoroids completely burn up about 100 km above the ground but very occasionally the core of a larger one will reach the Earth's surface. These are called meteorites. There are three basic types of meteorite: stony meteorites are rocks, iron meteorites are largely composed of iron and stony-iron meteorites which unsurprisingly contain both iron and rocky material. Are they valuable? Well, there is actually a flourishing trade in meteorites for collectors and some change hands for large sums. However their greatest worth is in what they can tell us about our Solar System. So if you are ever lucky enough to find a fallen meteorite, please donate it to your local museum, university or planetarium. That's what a proper astronomer would do, rather than put it on e-Bay!