

How to Observe and Photograph a Meteor Shower

Meteor showers are caused when Earth passes through the debris streams left behind by comets. On one or two nights around the peak of a meteor shower, it is possible to see a large number of meteors (shooting stars) in a very short space of time. Each shower has a point in the sky where all the meteors appear to radiate from. This is called the radiant, and will be located in a particular constellation. The shower is therefore named after this constellation. For example, the shower whose radiant is in the constellation Perseus is called the Perseids, on so on.



Perseid Meteor, 13th August 2013. Taken by Mary Spicer

Over the years I have had terrible luck with the weather in and around the peak of meteor showers! But in the past couple of years I've been fortunate enough to get at least some clear spells on the night when a meteor shower has peaked and this has given me the opportunity to observe and photograph quite a lot of meteors. In no way do I profess to be an expert meteor spotter after only a few meteor showers under my belt. But I did learn a few things which I think it may helpful to share.

You don't need any special equipment to observe meteor showers; just your eyes. Give yourself time for your eyes to become dark adapted (it takes 20 minutes for your eyes to fully adjust to the dark). If you want to photograph meteors, you need a camera which is capable of taking a continuous number of long exposure photographs. So here are my tips for how best to observe and photograph a meteor shower.

- **Dress appropriately** - it's an obvious one, but even in the middle of summer it can get really cold and damp when you've been sitting outside for 5 hours during the night. So dress warmly, use a blanket and keep a supply of hot drinks on hand.
- **Turn off any LCD display screens**, including your camera. If you get hold of some red acetate sheets you can make yourself a cover for your camera or phone screens. Red light does not affect your night vision but it is still a good idea to turn the brightness down, even with the red cover.
- **Use a comfortable chair** - another really obvious one, but if you are comfortable in a chair that tilts backwards, such as a sun lounger, you are less likely to strain your neck and will enjoy the whole experience more.
- **Have realistic ideas about what to expect** - in the run up to any of the principal meteor showers, the press is full of sensationalist headlines about what is coming. During 2014 we had one newspaper claiming that Halley's Comet was returning, when in reality we were heading towards a meteor shower caused by the debris stream of Halley's Comet, not the comet itself. And in December, during the run up to the Geminids meteor shower, one online publication claimed that you would see hundreds of meteors every minute. This is just not the case. Some confusion may arise because lots of papers will quote the Zenith Hourly Rate (ZHR) of a shower because it sounds better. For example, the often quoted ZHR for The Perseids is around 100 per hour. This does not mean that you will see 100 meteors per hour. The ZHR is the number of meteors you would theoretically expect to see from a very dark sky site if the radiant of the shower was at the zenith, i.e., the point directly above your head. It is rarely the case that the radiant of any meteor shower is directly overhead at any point during the night, so straight away you can probably cut that number down by at least a third. Any light or atmospheric pollution near to the horizon will reduce your chances of seeing any meteors which are low in the sky, so you can cut this value down again. The actual rates seen will also depend on the phase of the Moon; a bright Moon in the sky will greatly reduce your chance of seeing fainter meteors. So let's assume you are in a good dark sky site, the Moon is not interfering, and the radiant is just above the horizon; even with the best will in the world you can still only see half of your sky at once. As great as it would be, we do not have eyes in the back of our heads, so once again cut the predicted rate in half. So for The Perseids, a more realistic rate to expect would be around 30 per hour. Meteors can also be detected by radio so you can actually listen to meteors as they enter our atmosphere. In the run up to the Perseids meteor shower in 2013, I was hearing stories of rates of up to 300 per hour being quoted by the media. Radio will pick up meteor events that are not visible to the naked eye in addition to those which are, so don't be misled by these values. It is great fun to listen to meteors, but do not expect to see as many as the radio equipment can detect. Rates usually pick up after midnight, so you can expect to see more meteors if you observe in the early hours of the morning and in the hour before dawn.
- **Don't look towards the radiant** - during a meteor shower, the meteors appear to originate from a particular part of the sky, but they are actually visible anywhere in the sky. By looking directly towards the radiant, you may actually decrease your chances of seeing more meteors. Choose a point at least 45 degrees away from the radiant, and if there are 2 of you, look in different directions to increase your chances of seeing more meteors.

- **Be prepared** - I like to keep an accurate record of what I see, so I have a notepad and clipboard with me. I tend to use a new page for each hour of observing, and if I am trying to distinguish between the meteors which are the result of a particular meteor shower and sporadic meteors, I split the page in half. Each time I see a meteor I mark a dash on the page, then later on I count the number of dashes I've recorded. Turning the pages and trying to write the time at the top of each page in the dark is a nuisance, so I either label each page of my notepad, or print out observation sheets for each hour beforehand. In the dark it is hard to tell if the nib of a pen has been retracted or not, so I prefer to use a pencil, which I attach to the clipboard with a piece of string so I don't lose it in the dark if I drop it.
- **Chose a direction for your camera and leave it there** – Meteors are totally random so there is no way of knowing which way is best to point your camera. When photographing a meteor shower, chose a direction and then keep the camera pointing the same way. Constantly moving the camera around and pointing at different parts of the sky every 15 minutes or so can become a real distraction from observing. A whole sky camera would be great in this situation, but sadly I can't afford one of those! Instead, I chose a direction which is at least 45 degrees away from the radiant and at a 45 degree angle (advice I've read elsewhere), set the camera to continuous and just leave it there for the duration. This gives you a better chance of catching more meteors on camera, and it won't interfere with the visual enjoyment of it as much. If there are 2 of you observing, make sure your cameras are pointing at different parts of the sky to increase your chances of photographing more meteors. By shooting on continuous mode, as I've already explained, you stand a better chance of identifying satellites and aircraft and eliminating them from any possible meteor captures. Satellites and aircraft will appear over a number of photos and you can track the progress in each frame. It is very unusual for a meteor event to last long enough to span over 2 x 30 second frames. Over several hours of photographing the sky, you will get a LOT of satellites and aircraft on camera so you need to study your images carefully. I find that a setting of 30 seconds exposure at ISO1600 produces good results. Some of the meteors may be very faint, but by processing the images afterwards, it is possible to bring the really faint meteors out a bit more.
- **Protect your camera lens from dew** - If you are photographing a meteor shower, you have to expect that the lens will end up covered in dew at least once during the night, especially in winter, so keep a lens cleaning cloth handy to dry it off when necessary. You will need to refocus your camera each time you wipe it, so a better option is to help to prevent it from fogging up in the first place. Use a couple of reusable pocket hand warmers, and hold them against your camera lens using a sock with the toe cut off.



4 Geminids Meteors, 13th December 2014. Taken by Mary Spicer

There are several principle meteor showers throughout the year, some with higher rates than others. Below is a table summarizing when each one is visible. The exact date and time of the maximum varies from year to year, but this is a quick guide. The most prominent showers are highlighted in red:

Meteor Shower	Date of Maximum	Best Viewed	Number per Hour
Quadrantids	4 th January	Predawn	25
Lyrids	22 nd April	Predawn	10
Eta Aquarids	4 th May	Predawn	10
Delta Aquarids	30 th July	Predawn	10
Perseids	11 th – 13 th August	Predawn	50
Draconids	9 th October	Late evening	6
Orionids	21 st – 22 nd October	Predawn	15
Taurids	9 th November	Late evening	3
Leonids	17 th – 18 th November	Predawn	10
Andromedids	25 th – 27 th November	Late evening	5
Geminids	13 th – 14 th December	All night	75
Ursids	22 nd December	Predawn	5

Source: <http://www.almanac.com/content/meteor-showers-guide>

There are a lot of factors involved with how successful you will be when observing a meteor shower, and you need a huge dose of luck to catch a meteor on camera, but the thrill you get when things come together is unbeatable. So if there is a clear sky around the peak of a meteor shower, it's a pretty safe bet that you will find me lying in the back garden, huddled under a blanket with a very large mug of hot chocolate!