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Observing Meteor Showers



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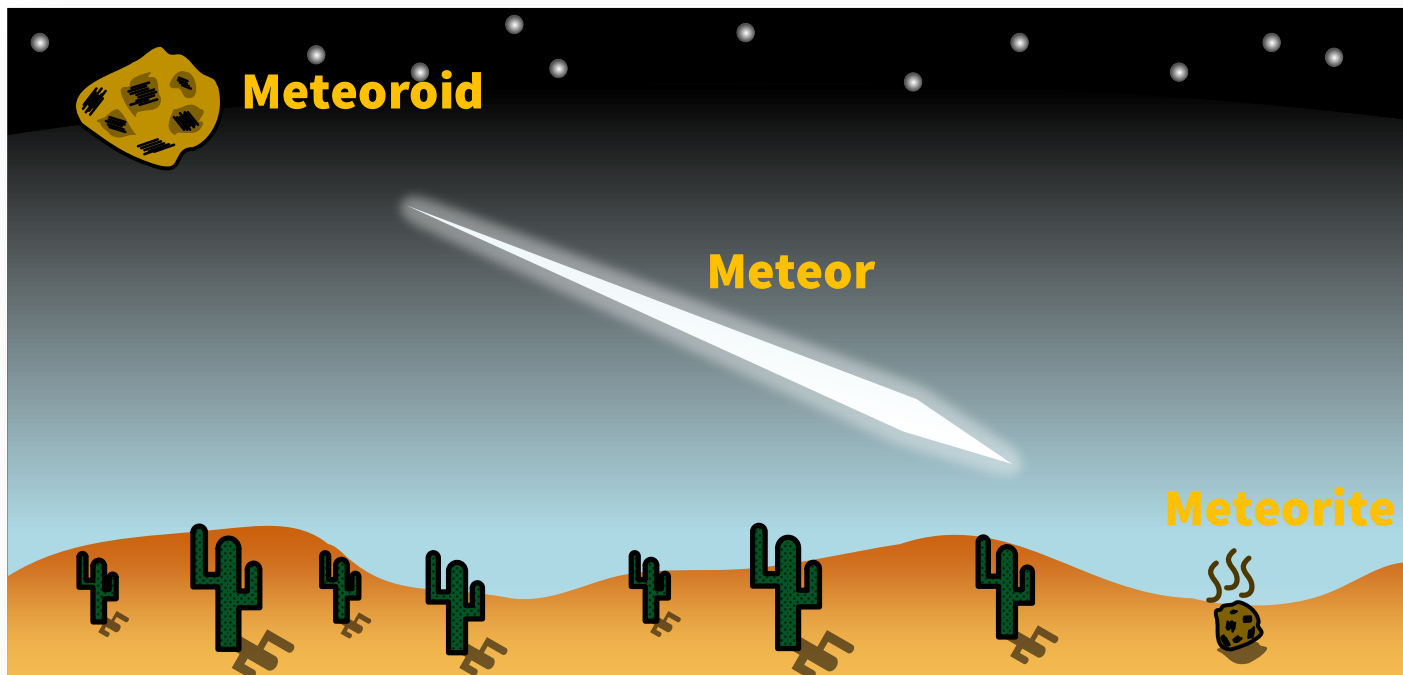
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The Facts About Meteors

Stories about spectacular meteor showers appear regularly in the news, but we all know that editors like to exaggerate, so how easy is it to see them in reality? In this short guide we'll explain all about meteors ('shooting stars'), how to observe them and what to expect.

What is a Meteor?

A meteor caused by piece of naturally occurring space rock (a meteoroid) which enters the Earth's atmosphere and briefly becomes visible as meteor on its journey towards the ground. Any part of the meteor that survives this fiery journey and makes it to the surface is known as a meteorite.



Why Do We See Meteors?

Most meteoroids are smaller than a grain of sand. They are made of rock, iron or a mix of both. Meteoroids travel at between 25,000 mph and 160,000 mph. That's fast enough to get from Essex to Australia in four minutes!

Meteoroids slam in to the Earth's atmosphere 50 to 75 miles above the ground. This compresses the air in a 'bow shock' similar to the wave created by a boat moving through water. The air is heated by this compression (not friction!) until it glows, making the meteoroid's path visible as a meteor.

Meteoroids larger than a grape are less frequent but create meteors brighter than the planet Venus. They are known as fireballs, or as 'Bolides' if they explode spectacularly when they reach the lower atmosphere. Every year, 500 fireballs larger than 1 metre in diameter create debris which makes it all the way to the ground as meteorites.

Exploding objects more than 20 metres in diameter which cause damage on the ground occur about twice every century. The 2013 Chelyabinsk meteor in Russia was just such an event and about 1,500 people were injured by flying glass from windows broken in the blast.

Meteoroids larger than 100 metres in diameter will make it to the ground intact and can create a crater a mile or more across. These large impacts occur about once every 5,000 years.



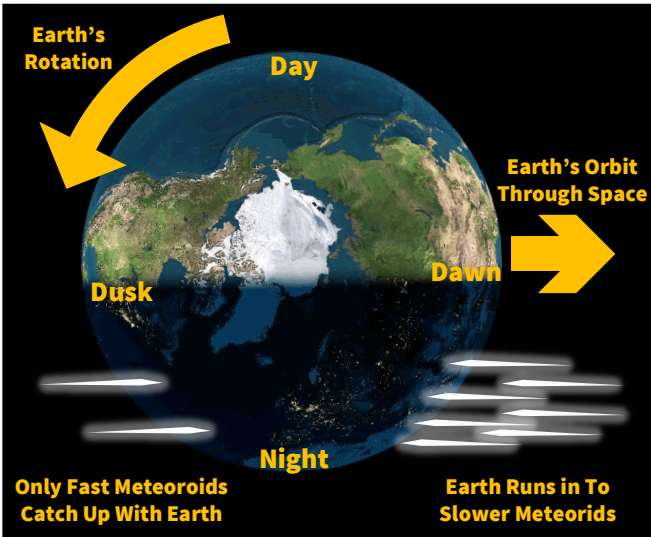
Barringer Crater, Arizona, USA

When Should I Look for Meteors?

Meteors can be seen at any time of the year. ‘Sporadic’ meteors bright enough to be seen with the naked eye occur at an **average** rate of about 4 to 6 per hour in the early evening, increasing to 8 to 12 per hour just before dawn.

More meteors are visible after midnight because the Earth is moving around the Sun at 70,000 mph. We face the direction of travel in the morning and away from it in the evening. This means that only fast moving meteoroids can catch up with the Earth in the first half of the night, but in the second half the Earth crashes in to the slower moving meteoroids like bugs being hit by a car windscreen.

The rate of sporadic meteors also varies through the year, from about 6 per hour in May and June to as much as 16 per hour in November. This is simply due to the amount of material scattered in different parts of the Earth’s orbit.



What is a Meteor Shower?

Meteor showers give you the best opportunity to see meteors. Each meteor shower is caused by a particular comet or, in a few cases, by an asteroid. As the comet orbits around the Sun, it leaves a stream of meteoroids in its wake. Each year, the Earth passes through this stream of debris on its journey around the Sun, and the additional material we encounter increases the number of meteors significantly for a few days. The most active meteor showers are listed below:

Peak Dates	Shower Name	Meteors per Hour	Caused By
January 3 rd -4 th	Quadrantids	5 to 25	Asteroid 2003 EH1
April 22 nd -23 rd	April Lyrids	3 to 10	Comet Thatcher
May 6 th -7 th	Eta Aquarids	3 to 10	Comet Halley
June 15 th -16 th	June Lyrids	1 to 4	Unknown!
July 28 th -29 th	Delta Aquarids	3 to 10	Comet since broken in to 3 others
July 29 th -30 th	Capricornids	2 to 7	Comet 169P/NEAT
August 12 th -13 th	Perseids	10 to 50	Comet Swift-Tuttle
October 8 th -9 th	Draconids	Less than 1	Comet Giacobini-Zinner
October 21 st -22 nd	Orionids	5 to 15	Comet Halley
November 3 rd -13 th	Taurids	1 to 3	Comet Encke
November 17 th -18 th	Leonids	3 to 10	Comet Tempel-Tuttle
December 14 th -15 th	Geminids	20 to 75	Asteroid 3200 Phaethon
December 22 nd -23 rd	Ursids	1 to 5	Comet 8P/Tuttle

The number of meteors you will see depends on several things, including the time of night as for sporadic meteors. Most importantly you will see more meteors if you are out in the country **away from light pollution**, and also on nights where there is **no Moon** to drown out fainter meteors.

For the most active showers, the number of meteors will typically start to increase noticeably a few days before the peak dates, and decline again for a few days afterwards. If you are a beginner, the most reliable showers are the **Perseids** (also it’s summer and warm at night in the UK), the **Leonids** and the **Geminids** as they all tend to put on a consistently good show from year to year.

What am I Looking For?

A meteor will usually appear as a streak of light moving across the sky in a fraction of a second. The brightness of the streak, the length of the streak, how fast it is and how long it lasts will all vary from one meteor to the next. Some meteor showers have a tendency to produce faster/brighter meteors than others due to the make-up and size of the meteoroids and their direction of travel relative to the earth.

In general meteors will tend to move slower in the early evening and faster towards dawn due to the Earth's motion through space as we previously explained.

A few meteors will be much brighter, slower and longer than normal and very occasionally you might be lucky enough to see a fireball. Sometimes meteors leave a glowing trail in the sky that persists for several seconds or even a few minutes, though this is fairly unusual.



Two Meteors Streaking Across The Sky

How Long Should I Wait?

Meteors appear completely at random. Long periods of time can go by with you seeing no meteors then suddenly two or three might appear in quick succession. Patience is an important virtue when meteor-watching.

Whenever we are observing as a group, a few people will spot a nice meteor just as everyone else is busy tying their shoelaces or fiddling with their smartphones! Even under the best observing conditions at the peak of a major meteor shower, the average rate of meteors is fewer than one every minute. Under more typical conditions, seeing an average of one meteor every ten minutes would be considered good, and even then there will be busy patches and periods with no action.

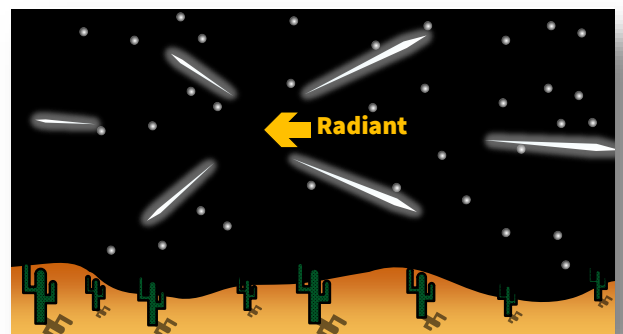
Where Should I Look?

Meteors can appear anywhere in the sky, so this is one area of astronomy where you don't need any particular knowledge of the stars.

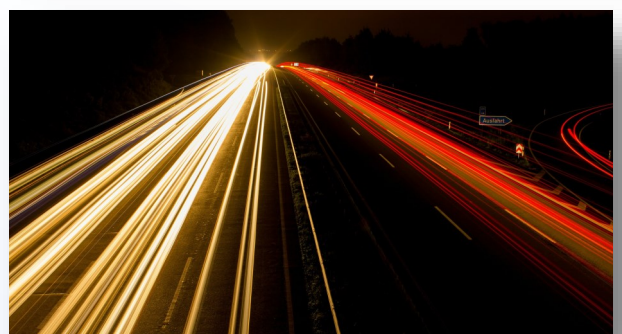
The best thing to do is look at the sky in the direction where you have a view that is not obstructed by buildings or trees, and ideally where there is the least light pollution in order to see fainter meteors. Try to take in as much of the sky as you can rather than focusing on one tiny spot, as this will give you the best chance to see a meteor.

Sporadic meteors will move in random directions, but meteors belonging to a particular shower will all appear to originate from one spot in the sky called the 'Radiant'. In reality, the meteoroids in a shower travel in parallel lines in the same direction as the orbit of their parent body just like cars in lanes on a motorway.

If you stand on a bridge over the motorway, the cars all appear to be coming from one spot on the horizon and the same optical illusion occurs for meteor showers.



Meteor Shower Radiant



Cars on a Motorway

You do not need to know where the meteor shower's radiant is in the sky in order to observe a meteor shower. After you've spotted a few meteors you can figure out roughly where it is by following the lines they made backwards until they cross over in the sky.

The meteors that appear near the radiant will be shorter as they are coming straight towards you, whereas looking away from the radiant will enable you to see longer meteors as they pass by.

What Equipment Do I Need?

The only things you need to observe meteors are your eyes, darkness and some clear skies. Your eyes will take 20 to 30 minutes to fully adapt to the darkness allowing you to see the faintest meteors. Avoid looking at bright lights or your phone whilst you wait, and it would be handy to get hold of a dim red-light torch which won't affect your dark adaptation.

Looking up at the sky for a long period of time can get pretty uncomfortable. Many seasoned meteor observers set up a recliner, deckchair or even a camping mat to lie down whilst they observe.

If you're observing in summer, insect repellent might be a good idea, and in winter wear multiple layers of warm clothes. You'll be standing or sitting around for a long period and you will get surprisingly cold after a while.

Observing in a group can make meteor watching more fun, especially if you turn it in to a competitive sport as we always seem to do!

I Thought I Would See A Firework Display?

Unfortunately, stories in the press tend to exaggerate the wonders of meteor showers, leading to disappointment when, beautiful as they are, they don't live up to the hype.

Very occasionally 'Meteor Storms' do occur where the sky is ablaze with thousands of meteors for a short period of minutes or hours. Perhaps the most famous was the great Leonid meteor storm of 1833 when perhaps 240,000 meteors were observed in nine hours over most of North America. It was described as seeming like the entire sky was falling to Earth.

These events are very much the exception and not the rule, and you would have to be incredibly lucky to see one. The Leonids have produced a number of similar storms over the past two centuries and meteor watchers continue to try to predict where and when the large clumps of meteoroids that cause them will hit the Earth, with limited success it must be said!

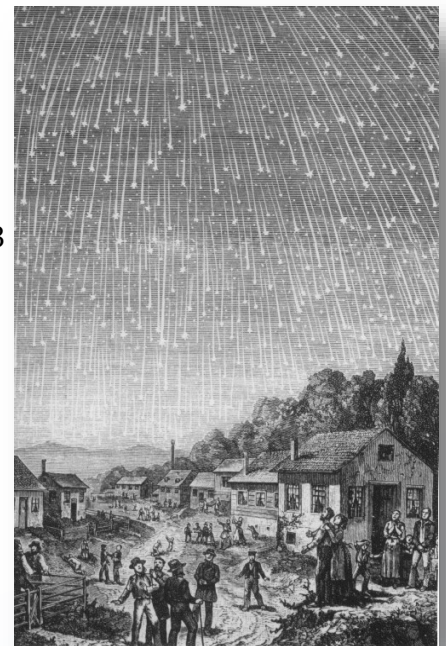
Are Meteors Dangerous?

Very large meteors such the one that killed off the dinosaurs are incredibly dangerous, but they are also incredibly rare, happening perhaps once every 100 million years.

In modern times, there have been a number of reports of animals killed by small meteorite impacts, including an Egyptian dog in 1911 and a Venezuelan Cow in 1972, but these are hard to verify.

The only person definitely injured by a meteorite was Anne Hodges in Alabama, USA in 1954 when a 4 kg meteorite crashed through her roof, bounced off the radio and hit her causing extensive bruising.

A car was damaged in 1938 by the Benld meteorite (USA) which went through the roof and embedded itself in the seat.



The Great Leonid Storm



Benld Meteorite

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