OAOG
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Summer Meteors

The Perseid meteor shower peaks on Saturday August 12

By: Pierre Martin

Above photo: *Perseid meteor from the 1997 shower. Photo by Pierre Martin.*

A good meteor shower can be spectacular. It is nature's way of shooting off fireworks. Even your non-astronomer friends can be suitably impressed as they exclaim "Look! A shooting star!!" as a bright multicolored streak appears to fall out of the sky.

Of course, meteors don't "shoot" nor do they "fall". The typical flash of light across the night sky is caused by a tiny dust sized particle, originating from a comet. We call these particles in space **meteoroids**. Astronomers estimate that approximately 100 million meteoroids (equivalent to 10 tons) enter the atmosphere every day! The momentary burning up of the particle and ionizing of the surrounding atmosphere at very high speed results in a brief glowing streak that is the visible **meteor**. Most meteors burn up at an altitude of 90 km. Larger solid particles might reach lower altitudes, or even reach the surface of the Earth as a **meteorite**, but those events are rare.

On any given clear, dark moonless nights, you could expect to see from 5 to 10 **sporadic** meteors per hour. Sporadics are meteors of unknown origin that are either tiny fragments of long ago asteroid collisions or ancient cometary meteor streams that have long since dispersed beyond recognition. As a general rule of thumb, the number of meteors visible in the evening will be low, but will increase gradually as the night goes on until they are more frequent near dawn. During the last few hours of the night, the Earth turns into the direction of our orbital motion and happens to pick up more meteoroids. This is similar to when you are driving in your car and it is raining outside - your front windshield will get hit with more rain than the back window.

The late nights can pay off. With luck, you might be rewarded by a spectacular meteor that far outshines every other object in the

night sky. Such meteors are called **fireballs.** They are the meteoroids of more significant size. An object the size of a golf ball could produce a meteor that is easily brighter than Venus! It is possible to see a fireball break apart as it disintegrates in the atmosphere, or perhaps even a sudden brilliant flash casting eery shadows on the ground! Look carefully for brilliant changing colors too! When a bright meteor fades away, the ghostly "after glow" of the ionized atmosphere can persist for several seconds or even minutes later! This "after-glow" is called the **train** or **wake**. High atmosphere "winds" (actually the Earth's magnetic field) can distort and twist a persistent train - something fascinating and dramatic to watch (just make sure you have your binoculars handy if you can too!!!).

Every so often during the year, we witness an increase in the numbers of meteors visible. This is when we assist to a **meteor shower**. This phenomena stems from comets - all those giant dirty (but wonderful) "snow balls" roaming the solar system. When these icy interlopers approach the Sun, they release enormous quantities of dust. The young dust accumulates in a dense cloud near the comet. Over the years, a number of forces such as the gravitational effects of the planets and solar radiation among other effects will disperse the dust further along the comet's orbit. Over the long run, the dust will eventually stretch itself out until it is spread all along an orbit of its own - forming a **dust stream**. Whenever the Earth enters such a dust stream as it travels along its orbit, we witness a meteor shower. Depending on the age of the stream, the Earth can take anywhere from mere minutes to several weeks to cross a stream. Every year, the Earth encounters about a dozen principal meteor streams, where the hourly rate reaches at least 5 meteors per hour. The upcoming Perseids is one of the best - they typically produce over 60 meteors per hour for an observer located under ideal conditions. But because dust streams are not spread out evenly, even the most reliable meteor showers can either perform better than usual in some years or be weaker in others. During the early 1990's, the Perseids was the most dynamic and active of all showers. Thanks to the return of its parent comet Swift-Tuttle near the Sun along with a new dense filament of dust, the Perseids produced short lived outbursts of hundreds of meteors per hour up until the late 90s! The comet is now heading into the outer solar system and the bright outbursts are gone. But in 2004, the Perseids made a mini come-back and treated observers with rates of 100-120 meteors per hour. In 2005, the display was back to normal. So what will

happen in 2006? The only way to know for sure will be to go out and look!

Principal meteor showers in 2006

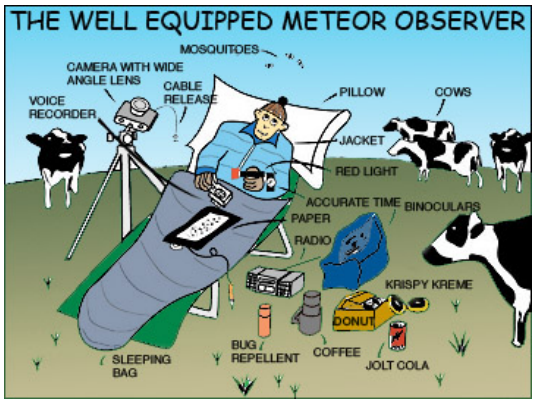
2006_shower_calendar.jpg ¨
You will notice that Perseid meteors can and will appear anywhere in the sky, but if you trace an imaginary line behind them, you will end up converging to a single point in the sky. This is called the **radiant**, and is caused by perspective due to the dust stream meteors all travelling into our atmosphere in parallel paths. The meteors that you see far from the radiant appear to shoot longer paths as they move away from you. The ones you see near the radiant will appear short and stubby as they are seen moving in a more "head-on" direction to you! (Don't worry, Perseids all burn up very high up in the atmosphere due to their brittle composition :0) We name meteor showers after the constellation where the radiant is located. In the case of the Perseids, the radiant is located in Perseus. Many people out to look for meteors mistakenly believe that Perseids will only shoot out of Perseus when they can and will actually be seen everywhere in the sky.

2006 Perseids forecast

For 2006, there's some good and bad news. The good news... the Perseids will conveniently peak on the mornings of Saturday August 12 and Sunday August 13. They are a wonderful shower with plenty of bright meteors! They can be seen when lots of people are already camping or spending time at the cottage, already under dark unpolluted skies. Unfortunately, the bad news... this year the Moon will spoil the show. It will be just a few days past Full and its overwhelming glare will render all but the brightest meteors invisible. Not good! At best you may see one or two dozens or so meteors per hour, assuming you have a clear sky free of obstructions such as trees, houses and other objects. But don't let the wash-out skies stop you!! Find a way to block the Moon or look away from it. As I said, the Perseids tend to produce lots of bright colorful meteors so something special can still be enjoyed. If you are lucky, you might even witness a beautiful fireball or two. You might want to start viewing the Perseids soon after sunset. The numbers will be low at such an early time, but the Moon will not only be less affecting but you may see a spectacular **earthgrazer**! An earthgrazer is a special kind of meteor - one that grazes the Earth's upper atmosphere at a very shallow angle. The result is

a meteor that appears to cross a huge path across several constellations over several seconds! You do not need to see many of these to be impressed. Perseids are considered to be fast meteors - they dash across our atmosphere at 59 km ***per second***! Many of the brighter ones tend to leave behind persistent trains too. If the peak nights are cloudy, don't despair. Look for a few stragglers in the days leading to or following the weekend.

Meteor observing tips



Meteor observing is one of the most comfortable and simple activity an observer could do. It can yield many rewarding and thrilling moments - and if one desires so, can easily contribute data for useful scientific study. You most likely have everything you need to get going too! A reclining chair, pillow, sleeping bag, warm jacket, some coffee or hot chocolate, pen and paper or a tape recorder to take notes, a red light, a simple pair of binoculars (to follow persistent trains left behind the bright fireballs) and perhaps a small radio and some snacks to keep you active. That's pretty much it! All you really need to do is get into a comfortable position for prolonged viewing (your neck will thank you!).

It's advisable to try and get as far from direct city lights as possible. The slightest nuisant light from a neighbor will seriously affect your viewing. Make sure that your immediate area is free of strong light sources too. Don't forget to cover any interior car lights or switch them to off. Dim red light will help illuminate your surrounding with the minimal impact to your dark eye adaptation.

The best area of the sky to look is to face away from the Moon or any distant city lights. Position your lawn chair in an angle so that your eyes fix a little more than halfway up in the sky. In the case of the moony 2006 Perseids, you may wish to position your feet toward the northern sky if at all possible - all while keeping the Moon behind your head. A large umbrella setup behind your head can also help avoid the glare from the Moon. This will help you see more meteors!

Another important tip is to get plenty of rest in the days prior to observing meteors. A tired observer will tend to fall asleep

quite early and will naturally miss many meteors. Fatigue can be avoided by taking several breaks during your watch. Get up and walk around every now and then too. Try to drag out a friend or two to keep you company, especially while you wait for meteors. Ask them to face different directions of the sky to increase the chances of someone spotting a good fireball.

Meteor observing requires patience! Even a good shower like the Perseids "only" produce a meteor every minute or so (and much less if the Moon or light pollution interferes). And the meteors rarely appear on cue. Many minutes can go by without anything being seen, but the next minute might produce a burst of a few meteors all in quick succession. The long wait is often rewarded.

Lastly, dress warmy and bring plenty of mosquito repellent.

Enjoy!

Above photo: *Perseid meteors captured near M31 (Andromeda galaxy) during the 2004 shower. Photo by Pierre Martin.*

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Excerpts from “The Pleasures of Amateur Astronomy”
by Pierre Martin

"... I've come to realize that one of the reasons I like to head out observing so much is to escape from the hubbub of everyday life - including computers, telephones and electronics.

... Whatever way we choose to pursue the hobby, it's all about an escape into the cosmos - an evasion of the mind - and a way to momentarily forget all our little daily problems. All of a sudden, our personal issues seem so vanishingly small and insignificant when staring up at the vast expanse above. In a constantly changing and fast-paced world, we've come accustomed to the unexpected. It's comforting to find the night skies presenting us constant clockwork and the same 'old friends' reappearing year after year. Few things in life are so reliable as that!

... I am most happy to travel to a distant dark site with nothing but my lawn chair, my coffin and a box of Krispy Kremes so I can settle in to do what I still love best - just looking up!!! Taking in long moments of nature's uninterrupted sights and sounds has always been among the most enjoyable and memorable times for me. A good aurora or major meteor shower is like a religious experience.

... And I can't say enough on the worthiness of traveling out to a good dark sky. Even with the extra time and effort it takes to get there, the quality of observing is dramatically improved! And those lost hours of sleep will be made up with memories and sightings you'd otherwise miss out from hazy skies or city light pollution.

Star Power

by Ken Tapping

If you hold up one square metre of black cardboard so that it faces the Sun on a very clear day, you will collect energy at a rate of almost 1400 Watts. Our Earth orbits the Sun at a distance of about 150 million kilometres. If we surrounded the Sun with a sphere of black cardboard having the radius of the Earth's orbit, it would collect all the energy radiated by the Sun, with each square meter of that card collecting nearly 1400 Watts. If we multiply the surface area of that imaginary sphere by the rate at which energy is collected by one square meter of its surface, we get the Sun's total energy output. The number we get is too big to easily visualize. However, if we use Einstein's famous equation, $E=mc^2$; we find the Sun is radiating 4 million tonnes of energy per second. That is not the amount of fuel the Sun is using per second, it is the rate at which the Sun is converting itself into energy. Moreover, the Sun is no record holder for energy production. Antares, that red star near the southern horizon is producing energy at more than 17,000 times the Sun's rate, and Deneb, a moderately bright star almost overhead these evenings is some 83,000 times more productive than the Sun. Deneb is turning itself into energy at a rate of 330 billion tonnes a second!

Deneb is certainly less than 50 times the mass of the Sun. If it is radiating energy at such a prodigious rate, it is going to run out of fuel in a much shorter time. Our Sun will be running into serious fuel shortage troubles in about four billion years, after a useful life of roughly 10 billion years. Deneb is going to hit the wall after less than 100 million years!

Life appeared on Earth roughly 2.5 billion years ago, pretty well as soon as our world had cooled off enough. By 500 million years ago, there were trilobites and other creatures living in the sea. It is more than sixty million years since the dinosaurs disappeared. Stars like Deneb won't last long enough for life to develop very far on any of the unfortunate planets they might have. Stars that are less massive than the Sun last much longer. These are the red dwarf stars. They are such stingy users of fuel that they will last pretty well as long as the universe. However, they are so dim their planets will be frozen solid.

Various radio observatories around the world are dedicating some of their time to looking for radio transmissions from civilizations on other planets. There are billions of stars, so it is necessary to identify the stars most likely to have planets with intelligent life. That seems to come down to orange, yellow or white stars with masses close to the mass of the Sun. Fortunately, there are lots of stars like that out there. For example, in the eastern sky during the late evening is the star Altair. This one is only 12 times brighter than the Sun and is a possible candidate for hosting life-bearing planets. This is not an original suggestion. Altair was the "star" in the movie *Forbidden Planet*, where there had been advanced life on the fourth planet. We are not yet able to go there to look. No radio transmissions have been picked up (yet).

Jupiter dominates the southern sky for most of the evening. The Moon will reach First Quarter on the 2nd.

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