

What is the point of seeing a Solar Eclipse?

What is the point of seeing a solar eclipse? This might be the link you just clicked on, or the article you just found in an old science newspaper. Whatever you really came here for, you expect another answer than “none” ☺ don’t you? Well, the answer is actually complex, very complex... If this article interests you, you must already know what a Solar Eclipse is... Or not? Or maybe you are not so sure about it? By “what is the point”, what do you wish us to answer to? What is the scientific point? Is it worth travelling around the world at a very expensive cost? Is there something non-scientific I could learn by seeing an eclipse (my girlfriend forces me to, but I find science boring) ☺ Good thing for you, this article is made for clearly anyone to find what it came for! Just look at the Summary down below and you will necessary find what you expected. And if you came here by absolute accident, or you just had time to spare, we wish you a good reading...

Intro (what you just read☺)

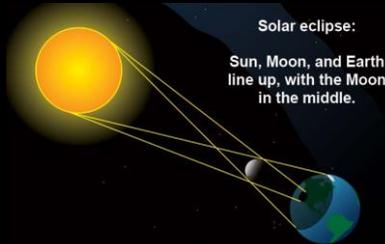
The Basics	○ What is a Solar eclipse and linked notions	p2
	○ Solar Eclipse throughout history (religion, culture, historical events, and history of science)	p2
Feeling it	○ All the Science you see when looking at a Total Solar Eclipse	p3
	○ Solar eclipse and our life (atmosphere and temperature)	p4
Science	○ Animals and Solar Eclipse	p4
	○ Radio-Observation Radio-Sunlight-interference-free (seems complex but isn't)	p5



Invitation to travelling (the beauty of the event and also this article’s conclusion)

What is a solar Eclipse and linked notions

A Solar Eclipse is a rare astronomical event. It is (very basically) when we can see the Moon pass over the sun. On a more astronomical axe, it means that both Sun, Earth and Moon must be aligned, (with the Moon in the middle, otherwise it is a "Lunar Eclipse").



As simple as this statement might seem, it is something that requires precise conditions, so precise it makes it very rare. As you surely know, it is often possible to see the Moon during daytime. That means the Moon can pass "under" and "above" the sun. The Moon's rotation axe around the Earth is not strictly aligned with our planet's rotation around the sun. So instead of happening once or more in a moth, it is approximatively an annual event. The required conditions are so precise, this annual event can be observed in a single place on earth, which it most of the time, not in your courtyard.

But if you are seeking for the Moon to pass in the very middle of the sun, and moreover to totally cover it (what is called a total eclipse) then, it complicates even more: The Moon's rotation way, and the earth's too, are elliptic, basically, it implies that the Sun <-> Moon and Moon <-> Earth distance changes for every alignment. So, it must make a sort of "Thales" condition, which is not very common, and this is why an eclipse happens not every day, and most of the time, in the ocean, for the same reason our home is called the Blue Planet.

Solar Eclipse throughout history (religion, culture, historical events, and history of science)

Throughout history, eclipses have always been of a major importance for how extra-ordinary they are (in both meanings).

The most legendary event is the non-verified story of Christopher Columbus, who, trapped in Jamaica announced to the aborigines there, that he would make the Sun/Moon (depends on the legend) disappear. When the eclipse happened, they thought he had magical powers. In antique Greek culture, people thought such event were doomsday! Greek History remembers of few cases of Mans who had a heroic action in front of an Eclipse. Pericles would have calmed all his mariners during one, proving how brave he was, Sulpicius Gallus would have predicted one and thanks to that reassured his men, and finally Alexander The Great is said to have done one of his greatest speech in front of his traumatized Soldiers! In imperial China, The Emperor Wen-Ti (around -170) and all china, witnessed a great Solar Eclipse, he considered it as a supreme being warning him for something awful he had done, so he published a declaration in all China for everyone to critic seriously all the stuffs he had done, opened to any help in improving his work.

Most civilizations have had religious beliefs about what was the cause of a total eclipse: Some West-African Tributes believed a cat's paw passed in front of the Sun, and so they would dance all the duration of it to celebrate; Aztecs fought is was a couple fight between The Sun and The Moon; Judeo-Christians considered it was God's hand he put over the Sun when he wished to, sometimes to create miracles. The most complex story is the one of The Indi Culture.



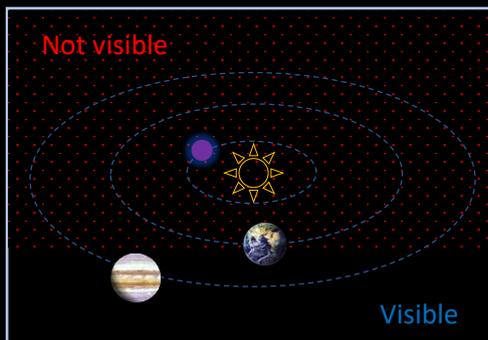
Long ago, there was a fight between Gods and Demons, to get the Amrita, wine that makes one immortal, Vishnu would have won it and when distributing it to the Gods, one Demon (Râhou) would have disguised himself and pretend he was a God to drink it. Only the Moon and the Sun saw it, and they tried to stop him, they decapitated him while he was drinking so only his head became immortal, since then he chases them both (that's why they move) and sometimes catches them (solar and lunar eclipse).

There is no religious vision of the eclipse in Islam, maybe for it is the most recent religion and was developed in the same period than the science development of Arabia; nevertheless, since Mahomed's son would have died the day of a solar eclipse, it is a day of bad luck, and it is recommended to pray a lot.

Despite all these non-scientific facts, Eclipses are what enabled the Greeks to see that the Moon is closer to earth than the Sun (for it is the Moon that passes over the Sun and not the opposite) and more recently one of the general relativity's validation experiments: Einstein's Theory explain that gravity deforms space (and time), during several eclipses (the first in 1919 and several others) we were able to see some stars very close to the sun, but later on, we realized that they were supposed to be *behind* the sun, and so not visible. A "proof" you can re-verify by yourself on the next incoming total eclipse!

The Helium atom was also discovered thanks to an eclipse, for a scientist discovered very weird rays on his spectroscope, (helium is high in the atmosphere, very uncommon); it was actually called Helium for this particular reason! (Helios-Sun in Latin)

Solar Eclipse throughout history *(religion, culture, historical events, and history of science)*



A Solar Eclipse is also a great opportunity for stellar observation. The Sun is known to be solar observation's greatest enemy (you can't see stars at night). It blocks half of the sky (day side), and if an astronomer just missed a specific star, he almost has to wait for 6 months until it is visible again. (Indeed, "winter stars are in the sky during summer days, and summer stars during winter day, so you can only observe them at their respective season, (that is in fact were their names come from...)

The under-domains who profits most from the event are planet observation and radio-observation Planet observation is indeed one very complex topic. Some planets, as Jupiter for example, are very slow (20 earthen years = 1 Jupiterian year), those, we can wait for the right season to study them, moreover, they are quite often farther from the Sun than we are, and so almost always lighten, when in the sky at night. Whereas planet close by the Sun, as Mercury are almost only in the sky during day (so we almost never get a chance to study them from the ground with reflected light. They used to be mostly studied when passing over the sun). An eclipse is almost only way to see them as in the "purple point" position on the upper drawing.

Then comes Radio observation. Radio-Telescopes are used regardless from day or night. It is to know that the Sun too, emits radio waves, so during an eclipse, even a partial one, the sun's influence is highly minimized, almost gone. That enables tacking pictures almost as clear as during night. (Even if they could just have waited a half year to do so... It might happen during a temporary event, who knows? So basically, the eclipse seems to be THE very best moment to take a radio-picture of mercury reflecting the sun's light. This whole thing may not be a major improvement but it has got compensate the absence of astronomers in observatory, for they have all gone in vacation for the occasion, isn't it?

All the Science you see when looking at a Total Solar Eclipse

The Sun is, if you remember your middle school science lessons, is a big ball of burning gas. More than just burning, there is actually nuclear fusion in its center (and that is where all that heat comes from). The center is, because of that, super-hot (15 million °K=°C; 27 million °F) while the border releases light (an enormous amount) and is exposed to the deep frost of Space. So it is cooler, but still, not cool (6 500°K; 6 000C; 11 000°F). So basically, since it is made out of fluid, the cold falls in lower altitude (dives into the sun, to the sun’s core) and the hot in higher ones (mounts up to the surface), but since the “hot” matter gets cold because it is now on the surface, and the cold is heated for it is now on the inside, everything repeats itself and it ends up with convection movements. During the continuous proceed, of convection, it sometimes happens that you get colder surface zones (4 000°K; 3 500°C; 6 000°F) we call sunspots.

Eruptions



Solar Wind



Last Sun ray



You can also end up with super-hot ones. Those will create giant ejections of mater called solar eruption, basically plasma, (smashed atoms) with a high majority of electrons (and some few ions). It can get up to several millions °K and °C, (which is around the double in °F) the average amount of matter that is continuously released out of the Sun goes up to 2 million tones (both metric and empiric) every second. That is what you may have heard of as “solar wind”. Today we have satellites orbiting around the sun, sending us thousands terra data per days. But a total eclipse is the only moment when it is physically possible to see both these eruptions and he solar wind (that in this case is referred as the “corona”) with one’s very own eyes.

In very addition to all these great phenomenon you can observe by only lifting your head up, comes a very incredible one: The Moon’s surface. You know the Moon has some mountains, and craters. In fact, you *know* because you were told so, but you never when there to verify it? Did you? During the very previous second of the total phase, the Sun shows you the Moon’s relief, with mountains, craters and everything. Maybe you know this very famous image of eclipse, what you see is actually the first appearing ray of light (or the last to disappear, depending on whether side of the Moon it is), that is actually the lowest altitude on the Moon’s side, the deepest place, that is logically the one that will let the last light pass (or first, once again...)

So to make it simple, an eclipse is a super rare occasion we encourage you not to miss for you must be expecting lots and lots of wonderful things to see!

Solar eclipse and our life (atmosphere and temperature)

Climate change is real. But that is not the current subject. During an eclipse, the Sun is no longer visible. The only reason you do not get total darkness is because you get remains of light from the lighten air around the eclipse zone, and the light from perpendicular solar winds. In only the small minute or two that the total phase lasts, you can experience a temperature decrease. It may be of about 5° (metric). If you add to that the fact that your area will keep enormous remains of heat coming from the warm ground or other elements around you, and hot wind from outer-eclipse zone, and maybe the people’s heat around you (for an eclipse rarely remains unnoticed), it is to realize how essential the Sun is to our survival. (-2 min Sun=-5° ⇔ no Sun = ???) The Sun isn’t just giving you cancer, sunburns, and greenhouse effect; it is necessary for us to breath (plants create O₂ with the Sun’s power) and not to end frozen. So next time you happen to pass by in front of a total eclipse, remember that... You will then feel all the incredibleness of the phenomenon, feel within your skin (without play on word on this particular occasion) how lucky we are both to see an eclipse, and to

Temperature in the All-American Eclipse (2017) Around the maximum area (source: Objectif Sciences Internationnale)		
Time	T° celcius	T° Farenheit
11h39	34	92
11h58	33	92
12h08	33	90
12h17	33	90
12h25	33	90
12h31	33	92
12h40	33	91
12h44	32	90
12h50	31,5	89
12h56	31	88
12h01	31	88
13h04	31	89
13h08	30,5	87,5
13h11	30,5	87,5
13h16	29,5	85
13h27	28,5	83
13h30	28	82
13h37	29	83
13h40	30	83

Animals and Solar Eclipse

The Sun is 10 00 times less powerful during an eclipse (when only 1% of it is visible) and the atmospheric temperature experiences a considerable decrease.

Facing this almost unnatural phenomenon, animals change their way of acting, “animals”? Well to tell you the truth, not all of them. The subject is rarely studied and so statistically not very reliable, due to the short length of the total phases, how rare it is, and the fact they only consider one only group of animals, during a single day, a single place and only a single time. Nevertheless, it has still be shown as an evidence by many. For first example, in 1932, by the Boston Natural History Society.

Some animals adopt a nocturnes attitude, Grasshoppers start singing as they would for dawn, while birds finally stop singing. And of course, opposite happens at the end of the total phase, which they appear to consider as a new morning, and so they start their morning routine.

Some do not even seem to notice, just as the lions and zebras and even more for squirrels.

And finally there are some who, maybe thanks to a superior intelligence compared to the others, act more “humanly”, noticing the phenomenon is quite uncommon: Chimpanzees appear captivated by the amazing view (as observed in 1984, in California’s Research Center on Primates).



But one other race has an exotic reaction, some very special animal we are currently living in (almost) harmony with: “Humans”. Many behavior, emotional and reaction changes have also been observed during an eclipse. Some kind of a “group hysteria” happens during the total phase, some shout, others cry. An unconscious anxiety sate due to the absence of light may be statistically observed for humans. Tension shows, some worries too, perhaps an uneasy feeling... Hopefully, (or sadly for those who enjoyed it) an eclipse has no long term effect on the organism (As Vladimir Fäinzilberg, a psychotherapeutic psychiatrist at the Moscow Psychiatrie Institute) it even seems that the event has a great positive impact since it is federalizing and socially reassembles, those who assist to one, make them feel like being at a very exceptional event! In some very calm places you may even “hear” the total phase “coming” and “ending” by the sound or shout/cheers of those who just saw it before you!

According to Michael Zerlin, an Eclipse Cartographer, from 1,5 to 7,4 million people are to be expected in the places or totality during the All American Eclipse of the 21srt of August 2017, which implies enormous population flux moving only to assist to the breath stacking view.

According to Rick Fienberg from the American Astronomical Society, the 2017 eclipse in America will be the most observed eclipse of all time (relatively peaking) for it happens on one of the most enormous surface of all time and moreover in a super developed country that did not restricted it’s com’ for the occasion!

Usually for an eclipse, and especially the ones in developed countries, telecommunications services (TV Radio or Cell phone companies), expect a massive communication on an eclipse.



So as you can see, an eclipse is something beyond description, far more than beautiful, a concentrate of science, knowledge, history and beauty, during (it is true) only 1min30 of total phase, and 4 hours of something that needs glasses to be seen. But how can you realize all if it is something truly beyond description? Well, of course, everything can be described with the right words, they just can't be find in this all-summed-up-go-to-the-essential-condensed article. So we invite you to jump to your computer and find were the next (preferably total) eclipse is; and if the cost is, sadly, to high, or that anything keeps you from see it with you own eyes, we have no better advice to give you than "learn"! Learn about it as much as you want, and even more, for knowledge of science is the greatest thing in existence, it is a gift only us, humans have, and we should enjoy it, as much as we can. So please feel free to follow this objective of science international; and don't forget to surf a bit, on the net, some eclipses pictures really worth the shot...

