

Mirages

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Introduction to Mirages

What is Mirage

A mirage is an optical illusion that is caused by [total internal reflection](#) during which light rays are bent to produce a displaced image of distant objects such as the sky. Mirages are virtual images caused by a large [refraction](#) of light as it travels through the air. The most common mirage occurs in warm weather when motorists see what appears to be a pool of water on the road close to the horizon. The explanation of this phenomenon is this: when air is heated, it expands and becomes less



dense, and when it cools, it contracts and becomes more dense. In

summer, the ground is hot and the layer of air that is nearest the ground is hot, while each layer further above is cooler. Light coming down from the blue sky passes through layers of air that are progressively less dense. Consequently, the light is progressively bent, and an image of the blue sky is seen on the road that is taken to be a pool of water!

- You might have seen a mirage while looking at a distant stretch of road on a hot day.
- Did it look kind of like it was shimmering, almost like there was water on the surface of the road?

What causes a mirage?

Distortions of light caused by alternate layers of hot and cool air cause mirages. Much like a mirror, a mirage shows images of things that are located somewhere else. However, the principal physical cause of a mirage is refraction rather than reflection.

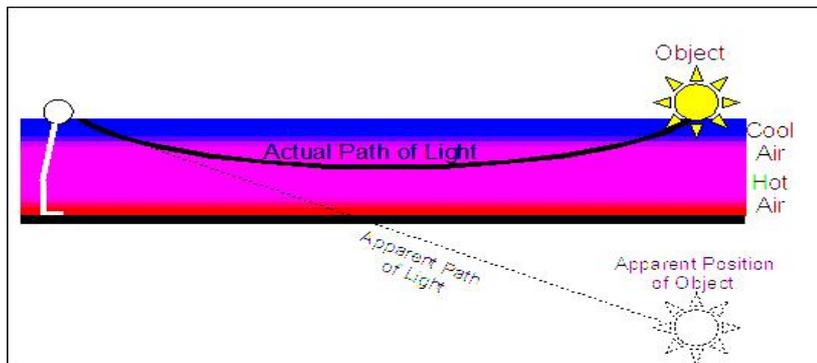
A beautiful mirage called the Fata Morgana appears in the Straits of Messina, between Sicily and Italy. It is an image of a town in the sky, like a fairy tale landscape. It is believed to be a mirage of a fishing village situated further along the coast.

Mirages are often categorized as "inferior" (meaning lower), "superior" (meaning higher) and "Fata Morgana", a subtype of superior mirage that consists of a series of unusually elaborate, vertically stacked images that form one rapidly-changing mirage.

Conditions for a Mirage

A mirage can only happen if very specific conditions are met.

- The air near the ground must be heated up by the sun's heat warming the ground (which is why we often see mirages above roads; their nearly black surfaces easily absorb thermal energy)
- The air a few meters above the ground must be much cooler
- The different temperatures of the air will result in the layers of air having different densities. Consequently, each layer of air will have a different [index of refraction](#)!



Light that is refracted from an object will make it

appear as though the object is being reflected off of the surface of the ground.

- If the sun is in front of you, then you may see the shimmering image of sunlight. Because it may be slightly distorted or even [polarized](#), your brain will likely interpret it as "water."
- Our eyes and brains always assume that light is traveling in a straight line. Even if it isn't, we have no way to know this.

Want to know more about mirages? [Click here](#) to schedule a live session with an eAge eTutor!

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Reference links:

- <http://en.wikipedia.org/wiki/Mirage>
- <http://en.wikipedia.org/wiki/refraction>
- <http://en.wikipedia.org/wiki/reflection>
- <http://www.britannica.com/EBchecked/topic/.../refractive-index>

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