

# Why do clouds sometimes look black

Learn about scattering!

## Equipment

- ◇ 2 transparent dishes
- ◇ water
- ◇ skimmed milk
- ◇ black ink
- ◇ an overhead projector



## Method

1

Put some water in each dish and place them on the overhead projector. They should look the same.

2

Add a little milk to one dish, and a little ink to the other. If you look at the dishes directly, what do they look like? If you look at the projected images, what do they look like?

If you look at the dishes directly, the difference between them is obvious, but the projected images are still identical. Looking at the dishes directly, the milky dish appears white because a lot of the incident light is reflected (scattered). The inky dish appears dark because incident light is being absorbed (and reradiated at a different wavelength).

The image on the screen is identical but the darkness is caused by different mechanisms. Light incident on the inky water is not transmitted to the screen mostly because of absorption, whereas light incident on the milky screen is not transmitted mostly because of scattering.

NB, if you put only a very little milk or ink in the dishes, you might see a reddish-brown image, because not all wavelengths are scattered an equal amount by milk, and not all wavelengths are absorbed an equal amount by ink.

## So how does this relate to the Atmosphere?

If you look at a cloud from above, you see it mainly by the sunlight reflected off it (scattered by it), whereas if you see it from below, a lot of the incident sunlight has been scattered, making the cloud seem darker than the surrounding sky.

If you could only see the cloud from below, you would not know whether the darkness was due to absorption or scattering.

## Where can I find more information?

Craig Bohren's book 'clouds in a glass of beer' has some more in chapter 11.

For more information about the colour of clouds have a look at:  
<http://en.wikipedia.org/wiki/Cloud#Colors>