

Why is the ocean blue?



One of these misconceptions is that *the ocean is blue because the sky reflection on its surface*. This is not true, but was believed to be so decades ago. **The real reason the ocean is blue is because the water, pure water, is blue.** Yes, according to its frequency spectra, water is a very light shade of turquoise blue.

But you need a huge amount of it to really see its color. It's like a teaspoon of oil, it looks transparent on a white spoon, but in the bottle looks yellowish.

If the ocean owed its color to the sky, it would be a lighter shade of blue and it would be white on cloudy days. You can see clouds reflected in the surface on the sea, but they don't completely change its color. Some constituents of sea water can influence the shade of blue you see in the ocean. This is why it can look greener or bluer in different areas. Swimming pools with white bottom, would have water that look transparent not turquoise blue, as it is observed even in indoor pools, where there's no sky to be reflected. The scientific explanation involves the theory of radiative transfer (absorption and scattering), and material electromagnetic spectra.

I asked Prof. Bob Stewart from Texas A&M to explain this in simple words so that kids could understand it, and below is his response.

**Dr. Sandra L. Cruz Pol, pol@ece.uprm.edu
Microwave Remote Sensing of the Ocean
Electrical and Computer Engineering Dept., RUM**


Why is the ocean blue?

The ocean is blue because it absorbs all the other colors. The only color left to reflect out of the ocean is blue.

Here is what happens:

Sunlight shines on the ocean, and all the colors of the rainbow go into the water. Red, yellow, green, and blue all go into the sea. Then, the sea absorbs the red, yellow, and green light, leaving the blue light. Some of the blue light scatters off water molecules, and the scattered blue light comes back out of the sea. This is the blue you see.
Regards, Bob Stewart



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<http://webexhibits.org/causesofcolor/5.html>

Why is water blue?

Water is faint blue. Although water appears clear in small quantities (like a glass of water), the blue color becomes visible the more water we look through. Thus, deep lakes and seas are bluer than a shallow river.

Other factors can affect the color we see:

1. Particles and solutes can absorb light, as in tea or coffee.
Green algae in rivers and streams often lend a blue-green color. The red sea has occasional blooms of red *Trichodesmium erythraeum* algae.
2. Particles in water can scatter light. The Colorado river is often muddy red because of suspended reddish silt in the water. Some mountain lakes and streams with finely ground rock, such as glacial flour, are turquoise. Light scattering by suspended matter is required in order that the blue light produced by water's absorption can return to the surface and be observed. Such scattering can also shift the spectrum of the emerging photons toward the green, a color often seen when water laden with suspended particles is observed.
3. The surface of seas and lakes often reflect blue skylight, making them appear bluer. [[[Montana reflection.]]] The relative contribution of reflected skylight and the light scattered back from the depths is strongly dependent on observation angle.

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But you need a huge amount of it to really see its color. It's like a teaspoon of oil, it looks transparent on a white spoon, but in the bottle looks yellowish.

If the ocean owed its color to the sky, it would be a lighter shade of blue and it would be white on cloudy days. You can see clouds reflected in the surface on the sea, but they don't completely change its color. Some constituents of sea water can influence the shade of blue you see in the ocean. This is why it can look greener or bluer in different areas. Swimming pools with white bottom, would have water that look transparent not turquoise blue, as it is observed even in indoor pools, where there's no sky to be reflected. The scientific explanation involves the theory of radiative transfer (absorption and scattering), and material electromagnetic spectra.

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