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Guest Blog

Stuff Physicists Don't Understand: Sonoluminescence [Video]

How can tiny collapsing bubbles inside a vat of water or other liquid reach temperatures of 20,000 degrees C? Nobody has a clue

By Yvette Cendes on October 14, 2016





Credit: Gerd Altmann Pixabay

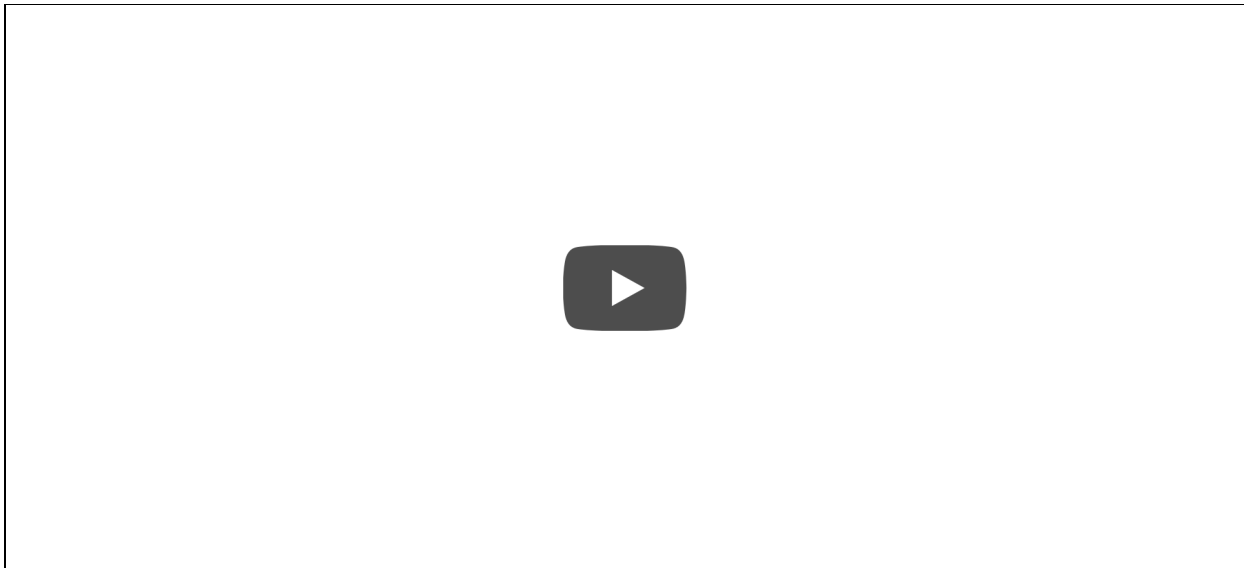
One reason physics is so exciting is that whenever you think we know a fair bit about the universe, you can find a new phenomenon where no one has a clue about what's going on. Some of these you don't even hear about much, because there are only so many ways journalists can cover the “scientists still scratching their heads” angle of a story. That's is a shame because enduring mysteries can be the most fascinating.

One of the mysteries that fascinates me is a phenomenon called sonoluminescence. Imagine you take a vial of liquid and run sound waves through it intense enough to create a bubble, a process called cavitation. Since the newly formed bubble is a very low-pressure area in the middle of the higher pressure of the liquid, it will quickly collapse. As the bubble bursts, crazy, inexplicable stuff happens. First, the interior of the bubble gets *insanely* hot. Laboratories have measured the center of the bubble at thousands of degrees, with recorded temperatures going as high as 20,000° Celsius. (To compare, the surface of the sun is only 6,000 degrees Celsius.) At the same time, you can detect a flash of light in the center of the bubble—usually bluish in color—lasting for just a few trillionths of a second. This flash of heat and light is sonoluminescence.

Here's what it looks like in a video by the [UCLA Putterman Research Group](#). Wait for the flash.



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Physicists have been observing sonoluminescence for over 80 years now, in various liquids from water to sulfuric acid. You can even find instructions online on how to do it. But what actually *causes* sonoluminescence? No one knows. I find this incredible—we live in an era where we can explain the first moments of the universe and how matter is formed, but can't explain why you get superheated light flashes when you run sound through a water bottle.

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