Quantum tunneling

Of course, if the barrier is too wide or tall, the chances of quantum tunneling occurring becomes scare because of the increased time needed needed to repay the amount of energy borrowed. (Quantum Universe) Funnily enough, waves share a quantum tunneling like component to them as well. If we were to increase the angle above a glass block's critical angle, we achieve total-internal reflection caused by a standing wave that does not transmit any light energy. This means all of the light that would exit the glass block before the critical angle is instead kept within the glass block, hence the name.

If we were to place another glass block next to the existing one with the total-internal reflection, you will see that light somehow travels into the added block, even though there is supposed to be total-internal reflection. The reason for that is the amplitude of the standing wave in the " forbidden" gap hasn't fully decayed. This phenomena is referred to as frustrated total-internal reflection. (Quantum Universe) The Scanning Tunneling Microscope (STM) works almost in the same way as the light waves do. The machine takes advantage of the " vacuum tunneling" property of electrons in order to study the surface of materials.

Electrons in a solid have a small chance of appearing outside of the metal surface. Much like the standing light wave, the probability of finding such an electron decreases the farther you get from the surface. If a sharp needle were brought close to the surface and applied a electrical voltage between it and the metal, a tunneling current will flow across the gap. By using the magnitude of this current, we can then map out the size of features on the surface. (Quantum Universe) Quantum tunneling helps our own sun with nuclear fusion.

They way fusion in a star works is that it heats up the surrounding particles, most likely hydrogen if it hasn't already gone through its supply. With the amount of gravitational pull inside the star coupled with the intense heating, hydrogen atoms and other atoms are able to fuse together to form new elements and, most importantly, sunlight. The way quantum tunneling aids this process is that it helps hydrogen atoms that haven't quite been heated up all the way fuse together anyway. Considering the size of our sun, quantum tunneling is always happening and giving us sunlight to absorb. (Minute Physics video on " Fusion and Quantum Tunneling")