

Schrödinger's Mirror Box

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Little Bobby is a 7 year old boy who had just came back from elementary school and he has a question/theory for you. Can you answer it?

Little Bobby's Conjecture:

Let's say that you have a box tiled with mirrors on the inside. You then take off the lid and point a laser pointer at the mirror. After this, you quickly close the lid, so quickly in fact, that the light is locked inside of the box. The light in the box will bounce off the wall until someone opens the lid again. Is this true?

The Problem:

If you open the lid to see if the light is still there, you will not see anything. This is because, by the time you open the box, the light will have already left the box. Therefore, you will never know if the light is still there. The light would be in a "quantum superposition". Hence the title of Schrodinger's Mirror Box

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Little Bobby's Test #1:

Little Bobby wants the solution to this problem, so he gets the box. On the corners of the box, he adds small pieces of mirrors or aluminum foil to reduce absorption. He went into a dark room, got a lux meter, and got a few mirrors that directed the light toward the lux meter. He then opened the box, if the lux meter even showed above 0 for just a split second, he could identify that the light was indeed still there. However, when he opened the box the lux meter showed nothing!

Solution:

The reason Little Bobby saw nothing was because all the light was absorbed by the mirror. Mirror can actually absorb 15 to 0.01 percent of the light they take in. However in 1998, MIT had created the first perfect mirror which reflects 100% of light thrown at it. This brings up another interesting question...

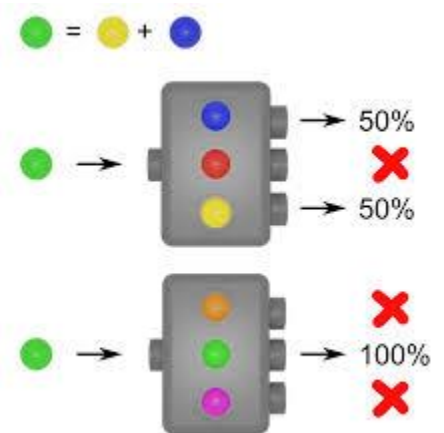
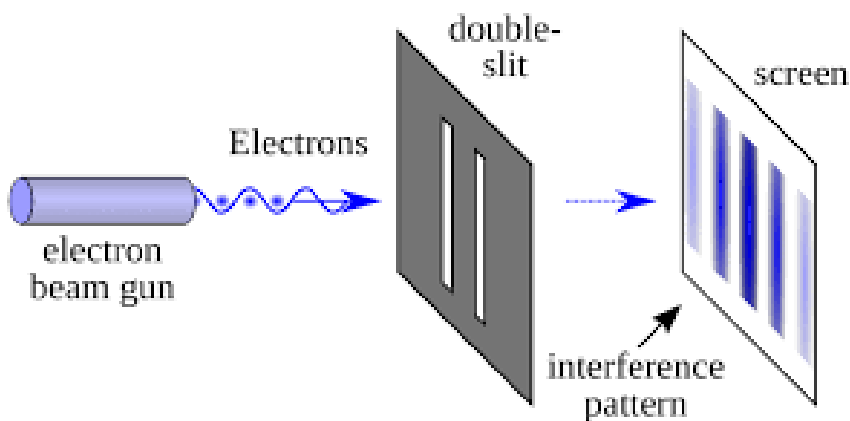
Little Bobby's Test #2:

Little Bobby is rich! So, he buys and tiles the box with six perfect mirrors, and there is no gap in the box. He then shoots a light inside the box and closes the box before the light leaves. He then comes back an hour later, and wants to see if the light is in the box. Is it?

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Final Solution:

In classical physics, it is reasonable to think since light is a wave, it would bounce around inside a perfectly reflective box forever. However since light exhibits wave-particle duality we have to also think about Quantum Mechanics. According to Quantum Mechanics, the state of a system is not fully determined until it is measured or observed. What does this mean? This means that the light in the box exists in a superposition of states, meaning that it is both there and not there and in every state possible, all at the same time until someone opens the box and observes the light. This basically means that whether you “see” the light or not would depend on the specific state the system collapses into. To understand, this concept even more please refer to the Schrodinger's Cat blog, we made in the Physics section.



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Conclusion:

Little Bobby would have seen one of the many possibilities that could have played out. For example Little Bobby could have seen a little light, but when Little Timmy recreated the experiment he could have seen no or even a lot of light.

The final conclusion we can draw from this experiment is that Quantum Mechanics is weird!

Sources:

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