**Here is my original email to Derek Muller ...**

**Derek, about a minute into your video you state:**

***"Measuring the spin actually changes the spin of the particle."***

[**https://www.youtube.com/watch?v=ZuvK-od647c**](https://www.youtube.com/watch?v=ZuvK-od647c)

**The only way that statement can be true is if you knew the direction of spin before the measurement. Yet, you admit that you cannot know the direction of the spin before the measurement. Therefore, on what grounds can you assert that the measurement has changed the spin?**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Here is Derek's reply (in italics)**

**which did not answer my original question;**

**and my followup email**

**(which he did not reply to)**

***Derek wrote:***

***If you make a measurement of the spin of a particle and find it to be vertically up, then every following measurement in the vertical direction will find the spin to be vertically up.***

**Derek, that reply brings up some questions:**

**How come those "following" measurements don't change the particle's spin?**

**According to your claim at 1:20 in the video:**

**"So measuring its spin actually changes the spin of the particle."**

**So based on your reply above, it seems like a more accurate claim might be:**

**"So measuring its spin actually changes the spin of the particle ... the first time it is measured, and *only* on the first time it is measured."**

**Then you would still have to explain how you know the spin changed on the initial measurement, since you had no way of knowing what the spin was before you measured it.**

***However if you then measure in the horizontal direction you'll find 50% of the time the spin is to the right and 50% of the time it is to the left. After this measurement the spin will remain the same as you measured it.***

**So you measure it initially in the vertical (which changes its spin), and then measure it in the horizontal (which changes its spin),**

**and after that - it will no longer change when measured?**

**I think I'm confused.**

***So the measurement has changed the spin from vertically up to horizontally left or right.***

**From your video, I got the impression that left and right were equivalent to up and down. Is that incorrect?**

**Aren't "left and right" (in the horizontal measurement) simply terms used to replace "up and down" (in the vertical measurement)?**

**I must be misunderstanding your explanation. If your patience hasn't worn out, can you point out where I have misunderstood your replies?**

**Also, under the video you wrote:**

***1. We know the entangled particles must have undefined spins before we measure them because if they didn't they would sometimes give the same spin when measured in a direction perpendicular to their well-defined spins (and they never do).***

**In your video you said that the term "spin" represents the reality that particles have angular momentum and an orientation in space.**

**Since it would be impossible for these particles not to have angular momentum and an orientation in space ... the word "undefined" must refer to the fact that, prior to measurement, we do not know what that angular momentum and orientation in space, is ... so we call it "undefined." But our not knowing doesn't change the fact that these particles must have those properties.**

**So if its spin is undefined, how do you know that measuring it, changed its spin?**

**neo**