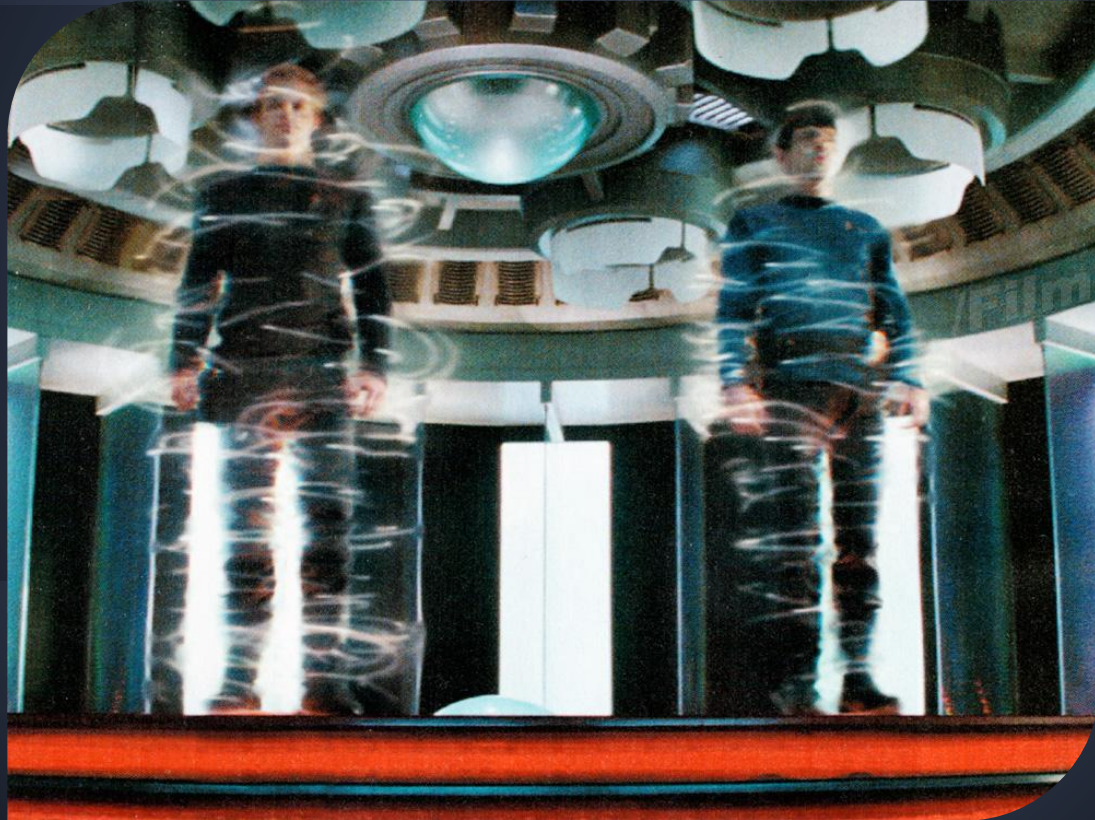


How will Teleportation Work?

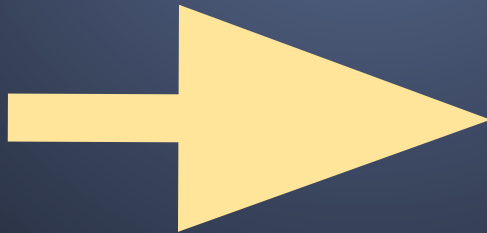
By: Mehmet Yilmaz





My name is Mehmet Yilmaz, I am 14 years old and for my passion project I wanted to learn how teleportation would work.

I wanted to learn the concept because since my family is Turkish, most of my family members live in Turkey. So to visit them I would have to take a day long trip, waiting in airports for hours and flying on planes for more than eleven hours. This has always been a pain for me, but I still did it to visit my beloved country. Still the trip is just too long. So I wanted to find a faster way to get there and that would be teleporting because theoretically it would just take me a few minutes to get there.



**Lets begin: How
would teleportation
work?**

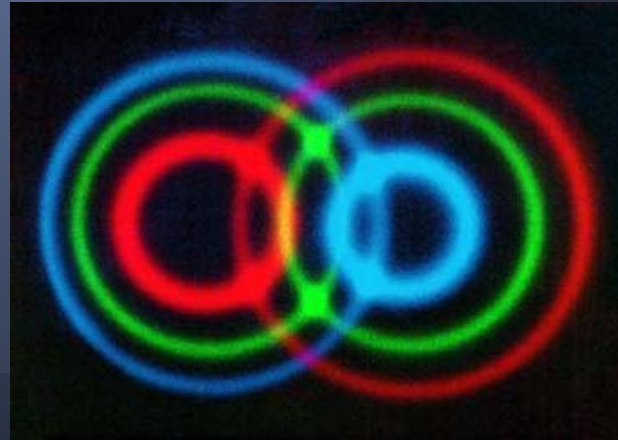
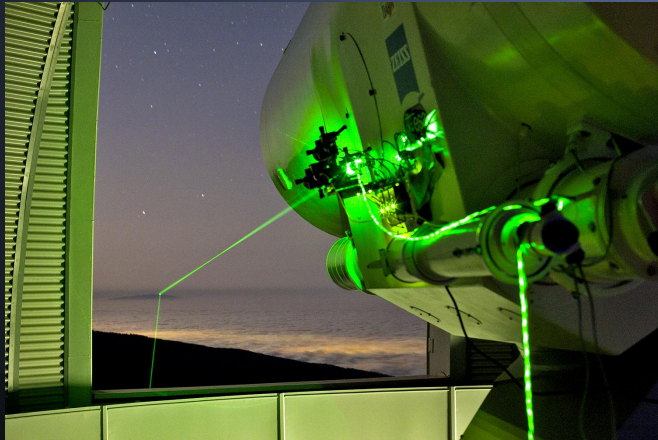
Teleportation is not what you think:



Teleportation is not like what most people believe it to be. See the idea of moving a person's particles to another location, then rebuilding them there can not be done in real life because there are certain laws that prevent such a task. But we can imprint a person's particle information into other particles. Knowing that we now have to forces on quantum teleportation.

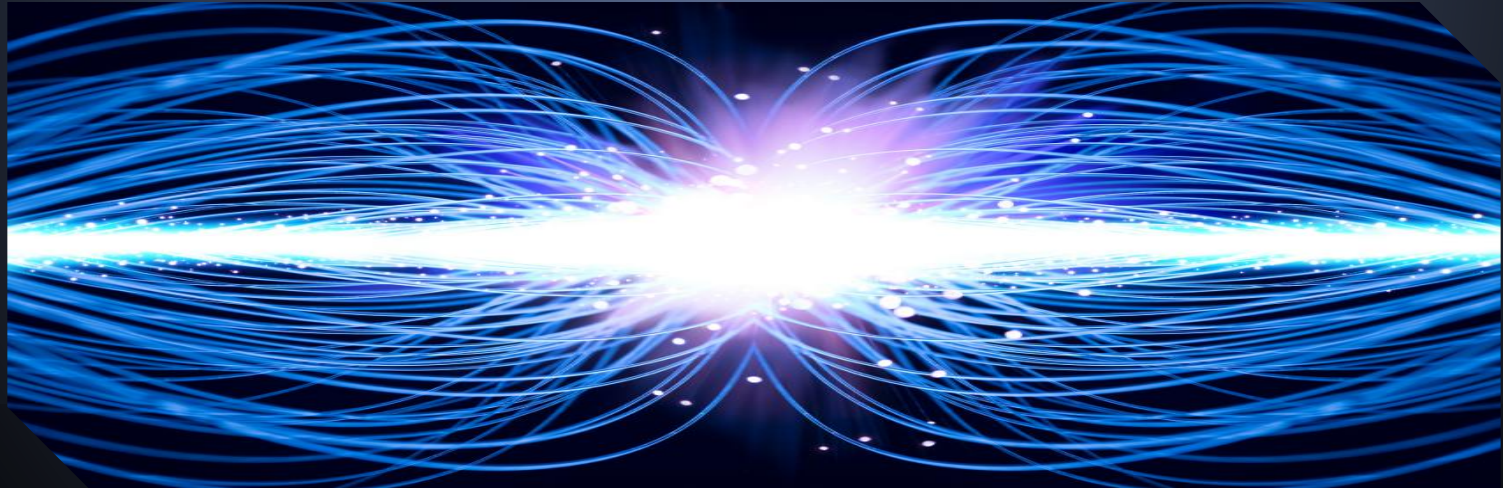
What is Quantum Teleportation?

Quantum teleportation is the process when quantum information can be exactly transmitted from one location to the other. This can be done with entanglement.



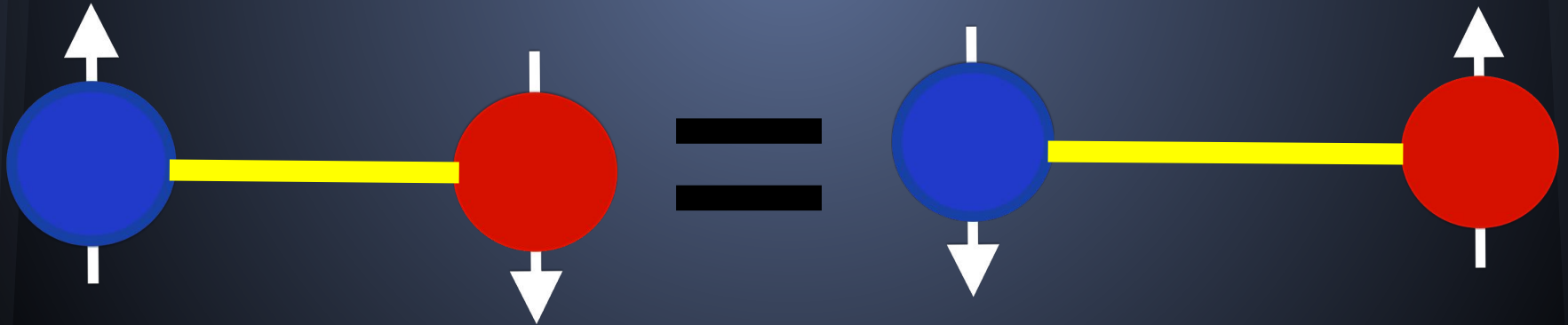
What is a Quantum Information?

Quantum Information is known as a bell-state or qubit, but basically quantum information is what state a particle is in. The state of a particle is determined by its spin (position and momentum). Also cool thing to note: A particle is believed to always be in a superposition, so it is in many random or different states. But when you measure a particle's state, it changes into a defined state, so it stops randomly changing states.



What is Entanglement?

Entanglement is when two or more particles act like one object, even though they are physically different objects. What this means is if two particles were entangled and you were to measure one of the particle's state, then the other particle will instantly be in the OPPOSITE state of the particle you measured first and vice versa. Also you can manipulate a entangled particle's state, so that the other particle will instantly turn into the opposite state of that particle. Also entanglement can be done, by forcing two unmeasured particles very close to each other.



-Albert Einstein called Entanglement the "Spooky Action" because even he did not get it.

Teleporting situation:

Lets say I wanted to teleport myself from the U.S.A to Turkey. I want not damage to my body, well in this teleportation. How would it be done?



Step One:

Get two particles (particle 1 and 2) and entangle them with one another. Then send particle 2 to Turkey and keep particle 1 in the U.S.A. Particle 1 will be with scientist Alice and particle 2 will be with scientist Bob. Take note the particles have not been measured at all yet.

1



2

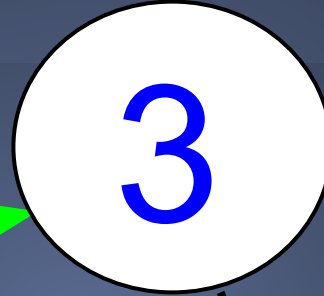
Step Two:

One of my particles (particle 3) is taken out of me and is place very close to particle 1 with Alice.

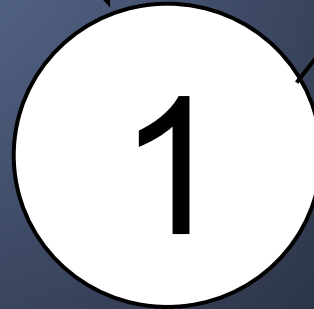
This is me, Mehmet Yilmaz:



(One of my particles)



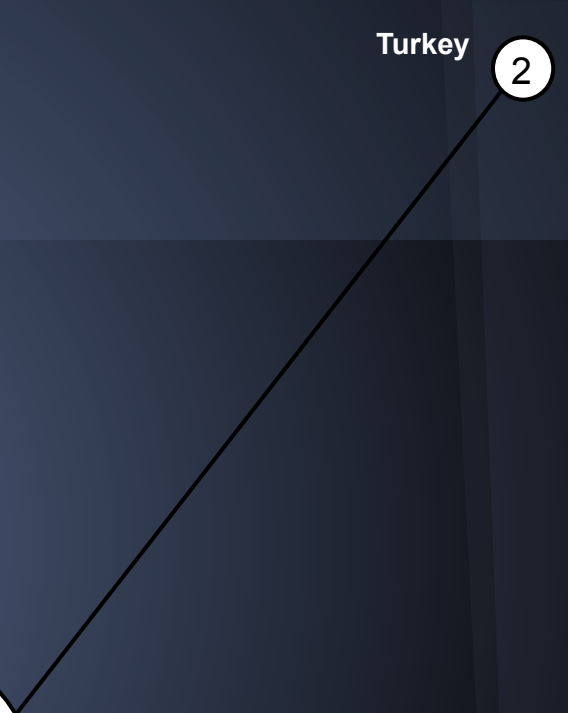
(My particle is force to particle 1)



U.S.A

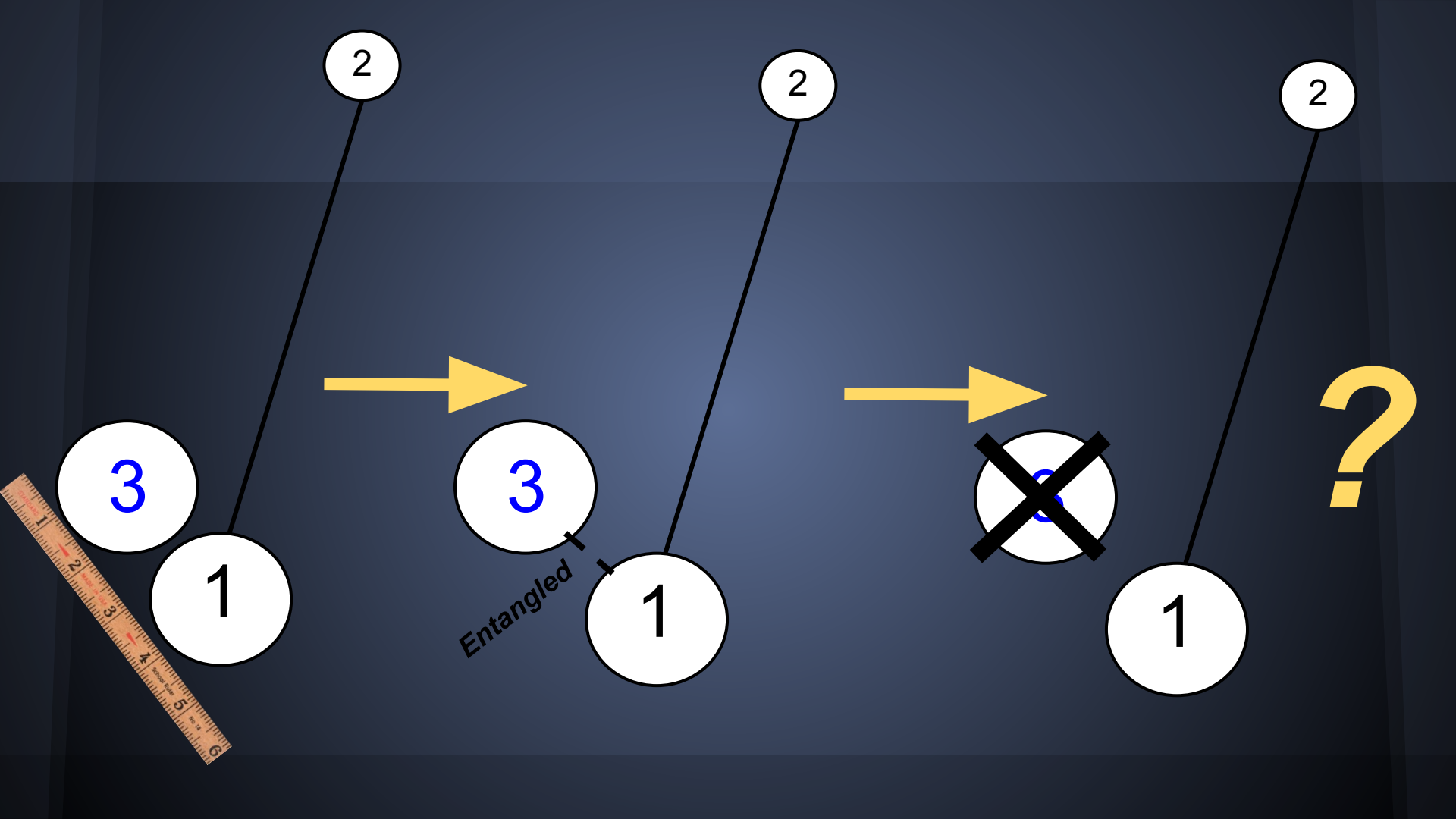
Turkey

2



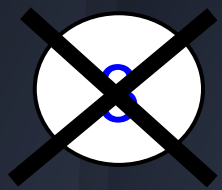
Step Three:

Alice will then measure both particle 1 and my particle 3. When this is done she will use the measurements she got to entangle particles 1 and 3. But when she does this, particle 3 will all of a sudden immediately disappears and die for a few seconds.



Step 4:

When particle 3 disappears, there will be four different outcomes. Three of which will affect particles 1 and 2 and one of which will not effect 1 and 2 at all. But if Alice and Bob were lucky particle 3 would replace particle 2 and the teleportation would be a success, but that is VERY unlikely.




(NONE)



Step 5:

After one of the four outcome occurs, Alice then sends her measurements of particles 1 and 3 to Bob, through a Classical Channel (radio, telephone, email ,etc).



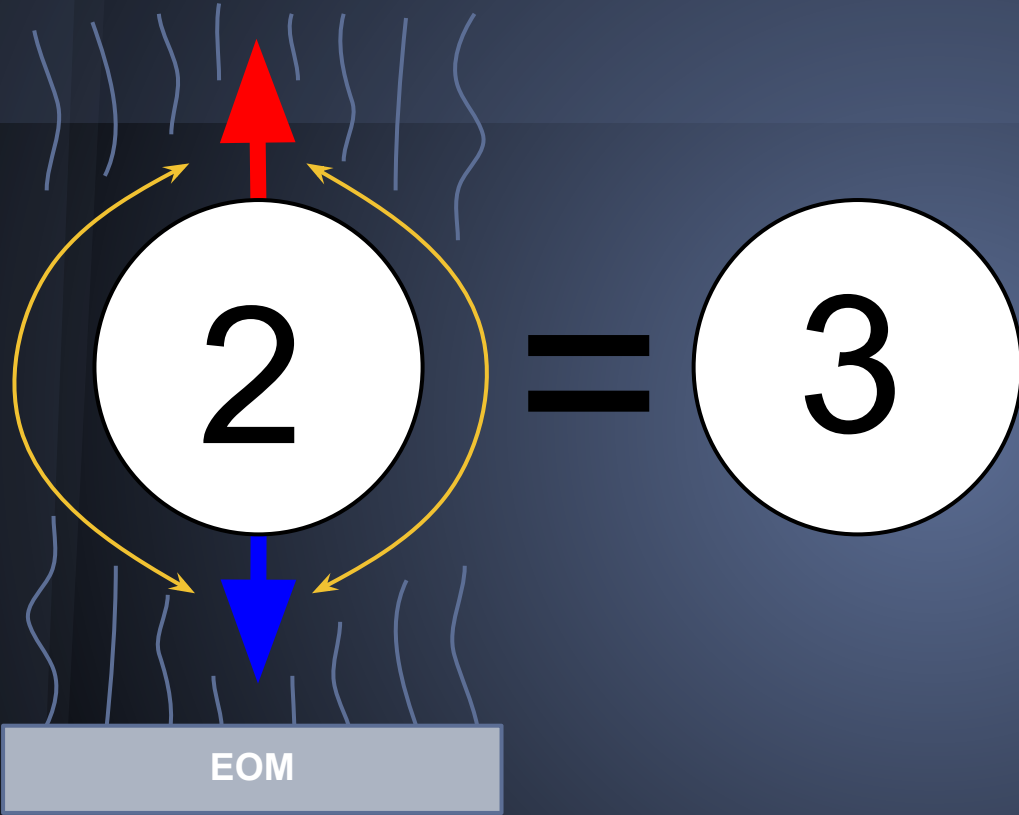
So Bob the measurements I got for particles 1 and 3 are...

Thanks Alice, I will use this info to manipulate my particle and try to get particle 3 at my location.

Step 6

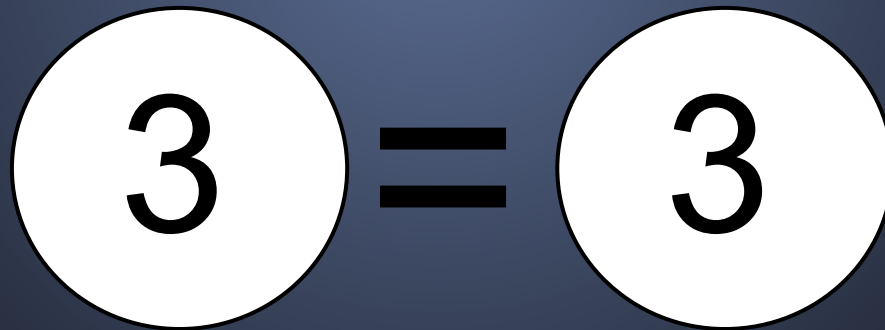
When Bob gets Alice's measurements, he then manipulates his particle 2's state in a way that particle 2 becomes (replaced as) particle 3, due to the spooky actions of entanglement.

EOM (electro-optical modulator)



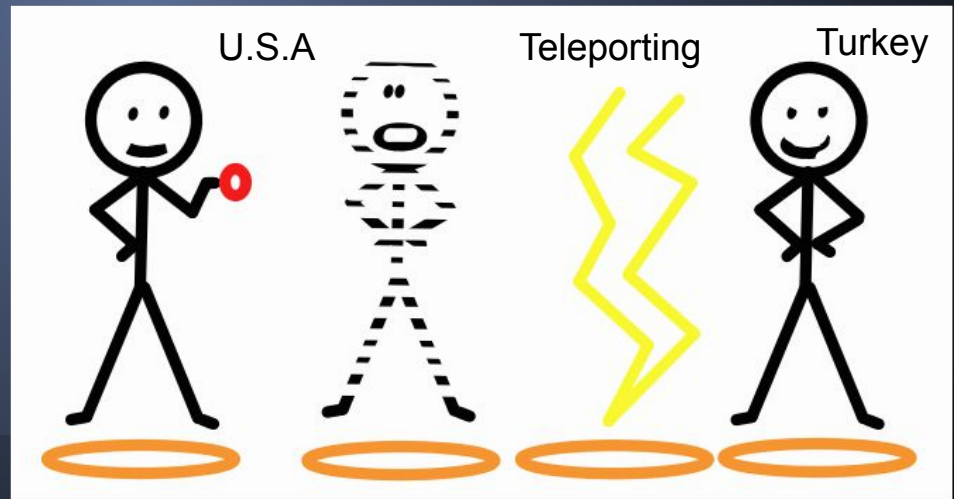
Step 7:

Finally Bob looks at particle 3 and makes sure it has the same state before it was teleported. When that is all done, the teleportation of particle 3 is done. Alice and Bob were able to teleport one of my particles.

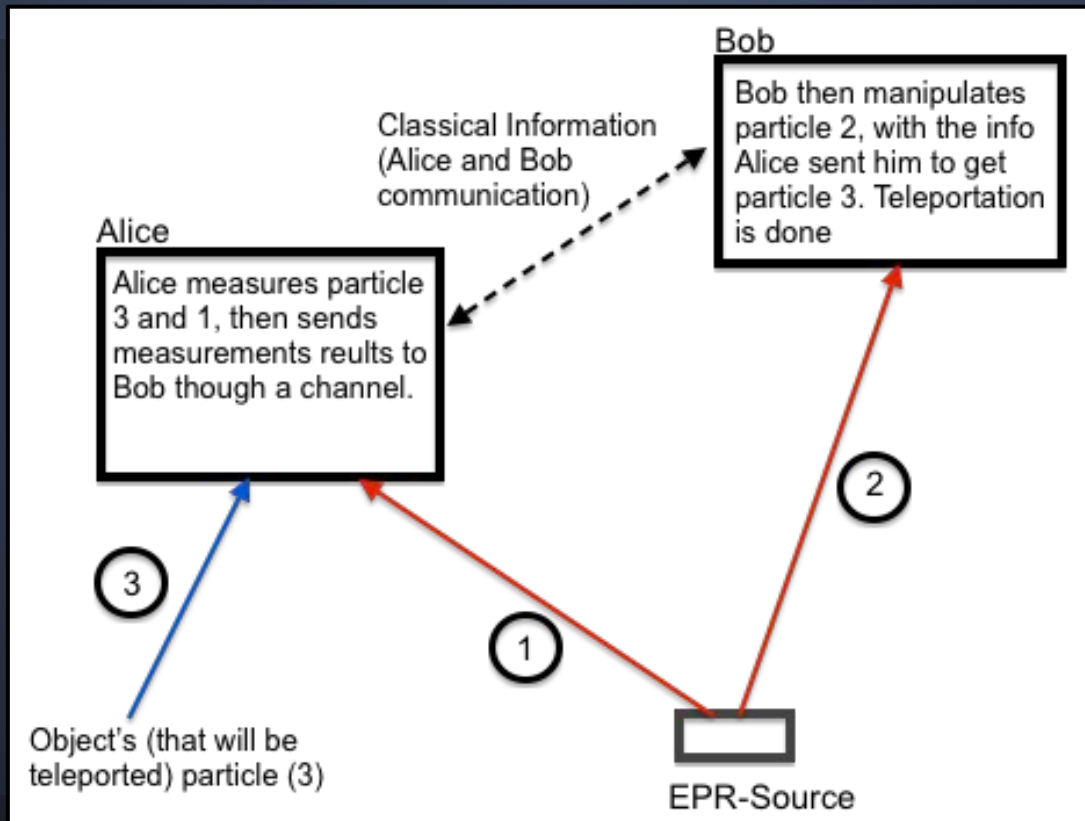


Extra Step:

Alice and Bob would then have to do all of these steps to ALL of my particles. And well doing this teleportation, I will disappear or die for a short amount of time. But at the end result, all my particle's info will be imprinted into a new set of particles.



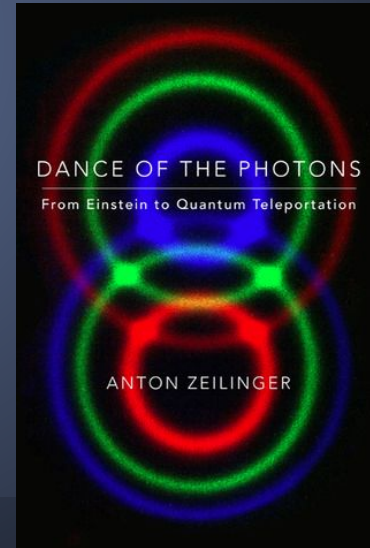
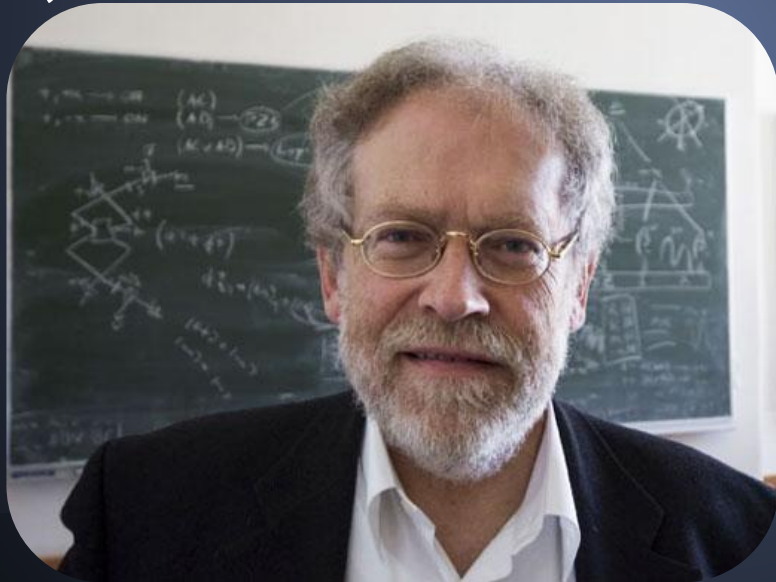
What we just did:



Has this type of
teleportation been
done yet?

YES! It has.

Many physicists have done quantum teleportation successfully. One example is physicist: Anton Zeilinger, who was able to teleport one photon 89 miles!



*Anton Zeilinger
novel: Dance of
the Photons*

Problems:

- There are just too many particles in any object, so with the technology we have now it would take decades or even centuries just to teleport one thing doing Quantum Teleportation. To give you a scale: This dot (.) has about 25 million particles in it.
- If the person who was measuring your particles, did a mistake. Like get wrong measurements, then they can't imprint your particles into other particles, so you would basically be dead in the worst way.
- Not only that but entangled particles for teleportation can only be used once. So when you teleport, you can't reuse the two entangled particles to teleport again.
- It would also take time to send a particle to the location you would like to be teleported to. The fastest speed you can send a particle is at the speed of light. This is fast but if you try to teleport to planets that are over light years away from Earth, then it would take years to teleport there.

How teleportation will help US:

Teleportation would make transportation 100% faster. So instead of waiting days for a packet of yours to arrive it would just take minutes. You can also take hour/day long trips in just minutes. Also with teleportation we can teleport information instantly, like bits from a particle's state. There are much more ways teleportation can help us and mankind altogether.

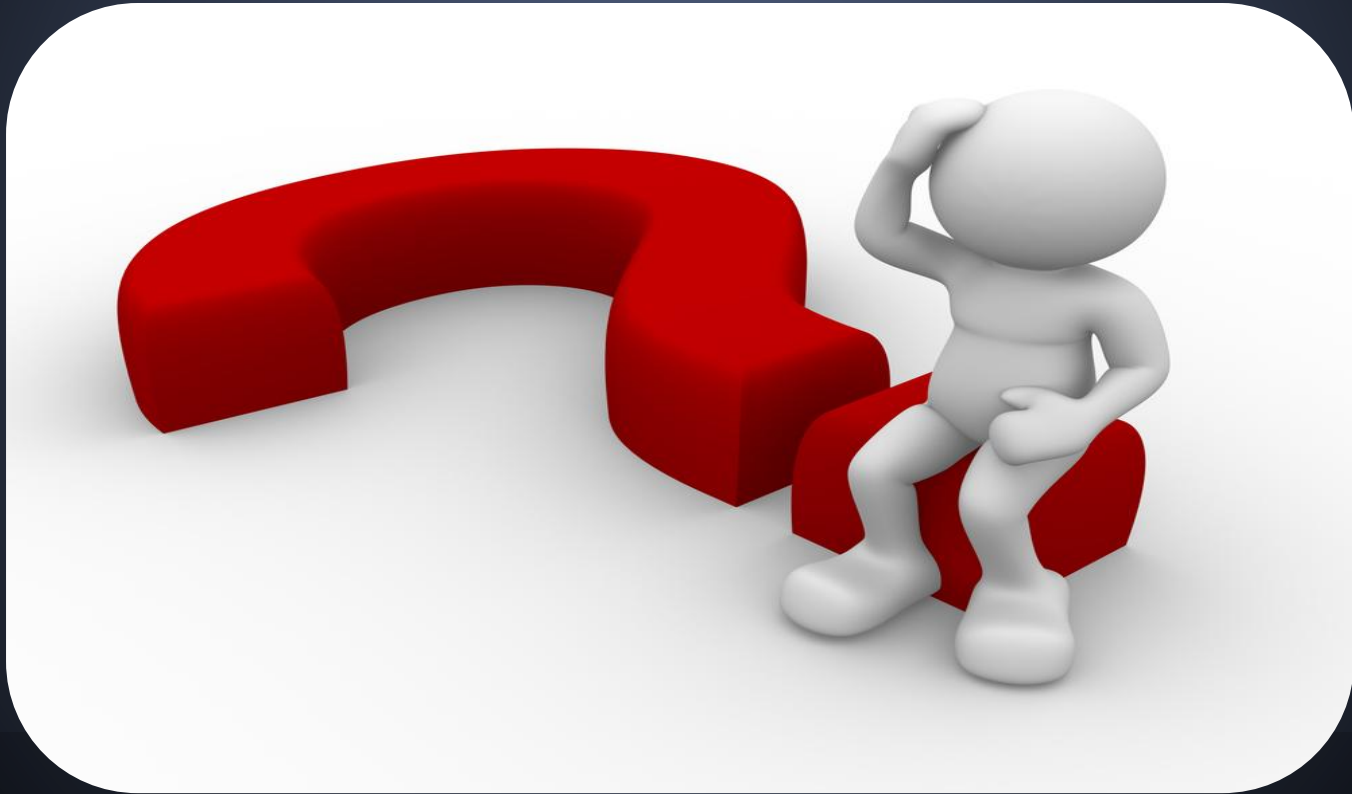


What did I learn?

I Mehmet Yilmaz have learned how teleportation would work. I have also learned the true power of a particle and how just a few can change the way mankind thinks. Also I am now kind of into Quantum Physics, even though it is a pain to understand. Not only that, but I have learned new ways to teach myself and many other new ways of studying. This would be very useful to me, since I am starting high school next year. I enjoyed doing the Passion Project and I hope I can do something similar to it in my high school. Also one more thing... GO EAST!!!



Got any questions?



Bibliography for Passion Project:

Subject: Quantum Teleportation

"Basis (linear Algebra)." *Wikipedia*. Wikimedia Foundation, 19 Apr. 2014. Web. 03 May 2014.

BestOfScience. "Quantum Entanglement - The Weirdness Of Quantum Mechanics." *YouTube*. YouTube, 13 Feb. 2010. Web. 29 Mar. 2014.

"Binary Code." *Wikipedia*. Wikimedia Foundation, 21 Apr. 2014. Web. 29 Apr. 2014.

"Complex Number." *Wikipedia*. Wikimedia Foundation, 05 Apr. 2014. Web. 03 May 2014.

Diginfo TV. "A World First! Success at Complete Quantum Teleportation #DigInfo." *YouTube*. YouTube, 10 Sept. 2013. Web. 10 Apr. 2014.

"Element (mathematics)." *Wikipedia*. Wikimedia Foundation, 05 Apr. 2014. Web. 05 May 2014.

Grant, Andrew. "Quantum Teleportation Approaches the Computer Chip." *Science News*. Web. 29 Apr. 2014.

"Introduction to Quantum Teleportation." *Introduction to Quantum Teleportation*. Web. 29 Apr. 2014.

K Stepp. "Quantum Mechanics Explained or Quantum Theory For Dummies." *YouTube*. YouTube, 27 Feb. 2013. Web. 02 May 2014.

"Linear Combination." *Wikipedia*. Wikimedia Foundation, 05 Apr. 2014. Web. 05 May 2014.

Martiniere, Stephan. "Crazy Far." *National Geographic* Jan. 2013: 68-81. Web.

"Quantum Entanglement." *Wikipedia*. Wikimedia Foundation, 28 Apr. 2014. Web. 29 Apr. 2014.

"Quantum Mechanics." *Wikipedia*. Wikimedia Foundation, 05 Dec. 2014. Web. 13 May 2014.

"Quantum Network." *Wikipedia*. Wikimedia Foundation, 30 Mar. 2014. Web. 29 Apr. 2014.

"Quantum Teleportation." *Popular Science*. 14 Aug. 2013. Web. 29 Apr. 2014.

"." *Quantum Teleportation*. Web. 3 Mar. 2014.

"Quantum Teleportation." *Wikipedia*. Wikimedia Foundation, 23 Apr. 2014. Web. 29 Apr. 2014.

"Qubit." *Wikipedia*. Wikimedia Foundation, 27 Apr. 2014. Web. 29 Apr. 2014.

"Spin Polarization." *Wikipedia*. Wikimedia Foundation, 18 Apr. 2014. Web. 03 May 2014.

"Transporter (Star Trek)." *Wikipedia*. Wikimedia Foundation, 05 Nov. 2014. Web. 13 May 2014.

"Unitary Transformation." *Wikipedia*. Wikimedia Foundation, 05 Apr. 2014. Web. 04 May 2014.

"Unitary Transformation." *Wikipedia*. Wikimedia Foundation, 05 Apr. 2014. Web. 04 May 2014.

"What Can Quantum Computers Do?" *YouTube*. YouTube, 19 Nov. 2013. Web. 29 Apr. 2014.

"What Does the Quantum State of a System Tell Us about Itself?" *Wavefunction*. Web. 02 May 2014.

World, Phycis. "How Does Quantum Teleportation Work?" *YouTube*. YouTube, 23 Aug. 2012. Web. 29 Apr. 2014.



**Thanks for Watching
Have A Great Day!**