Entanglement

Even when **far away** ...
(for example at the different sides of the universe)

... particles can be **connected** ...

... in a way that each of them cannot be described independently of the other.

But, what does this mean?

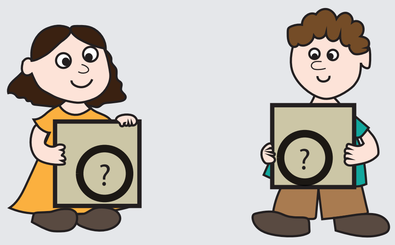
Imagine we have 2 balls

each of them either

orange or **green**

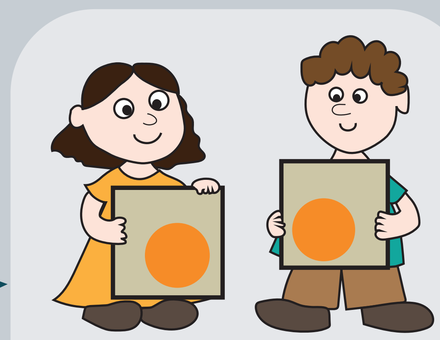
And imagine they are in a quantum **superposition** such that there is **50%** chance for having **both balls orange** and **50%** for having **both balls green**

Now, let's put the balls in the separate boxes. We give one box to Alice and the other one to Bob



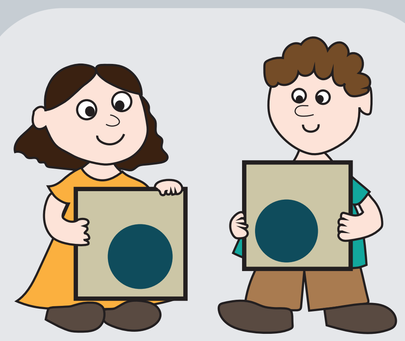
Neither Alice nor Bob know the color of the balls in their box!

What we know from the state above is that the balls of Alice and Bob are the same color - however, we do not know what the color is:



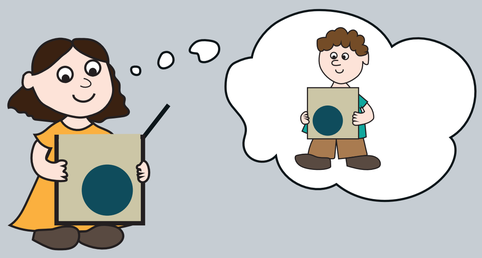
50%

or



50%

If Alice opens her box and finds a ball that is **green**, she **instantly knows** that Bob's ball is also **green**!



Opening her box, Alice destroys the superposition in both her's and Bob's ball.

(And analogously, if she opens the box and finds an **orange** ball - this means that Bob's ball is **orange** as well)

Therefore, by opening her box, Alice is influencing the state of Bob's ball - no matter how far away they are from each other.

Such connection between the two objects is called ENTANGLEMENT and it is a purely quantum phenomena

Today, experimental progress allows us to isolate, prepare and control individual quantum systems, exploiting their entanglement for the development of algorithms and protocols capable of solving certain tasks much faster than its classical counterparts.