

Chi ha ordinato quel?

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(PhD, Particle Physics)

Who Ordered That?

Dr Matthew Kirk
(PhD, Particle Physics)

What we are made of

- Atoms make up everything

What we are made of

- Atoms make up



What we are made of

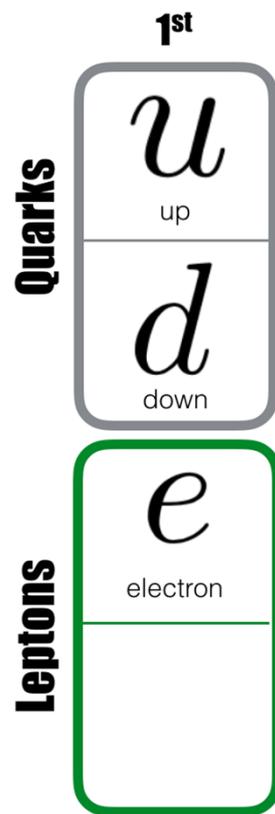
- Atoms make up everything
- Atoms made of protons, neutrons, electrons
- Protons and neutrons are made of up and down quarks

What we are made of

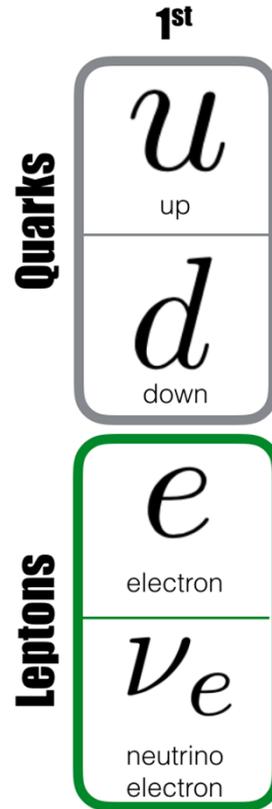
- Atoms make up everything
- Atoms made of protons, neutrons, electrons
- Protons and neutrons are made of up and down quarks

- So it seems like all you need to make a universe is:
 - Up quarks, down quarks, electrons

Standard Model



Standard Model



Standard Model

	1 st	2 nd	3 rd
Quarks	u up	C charm	t top
	d down	S strange	b beauty
Leptons	e electron	μ muon	τ tau
	ν_e neutrino electron	ν_μ neutrino muon	ν_τ neutrino tau

3 of everything

- The Standard Model has 3 copies of all the particles that make up matter
- But the world around us is only made up of one set

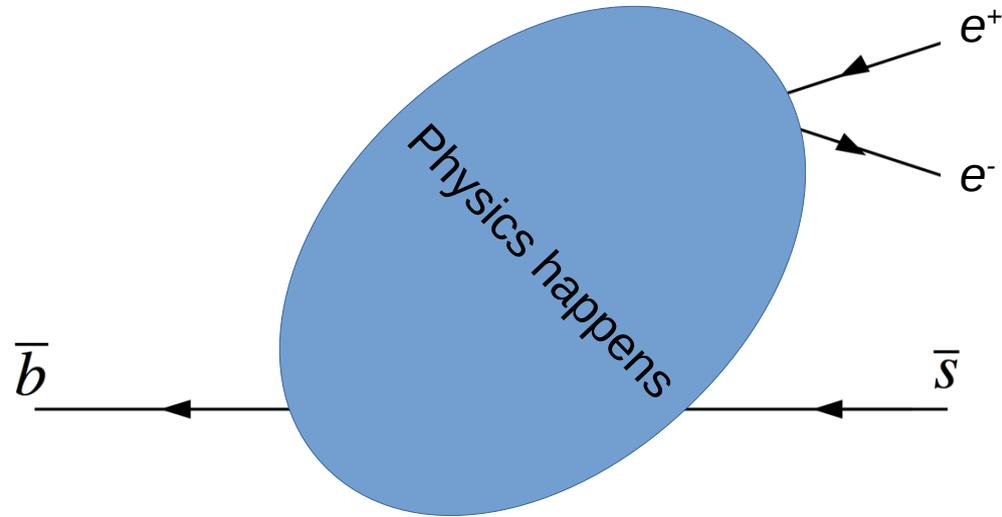
3 of everything

- The Standard Model has 3 copies of all the particles that make up matter
- But the world around us is only made up of one set
- So who ordered the other two?

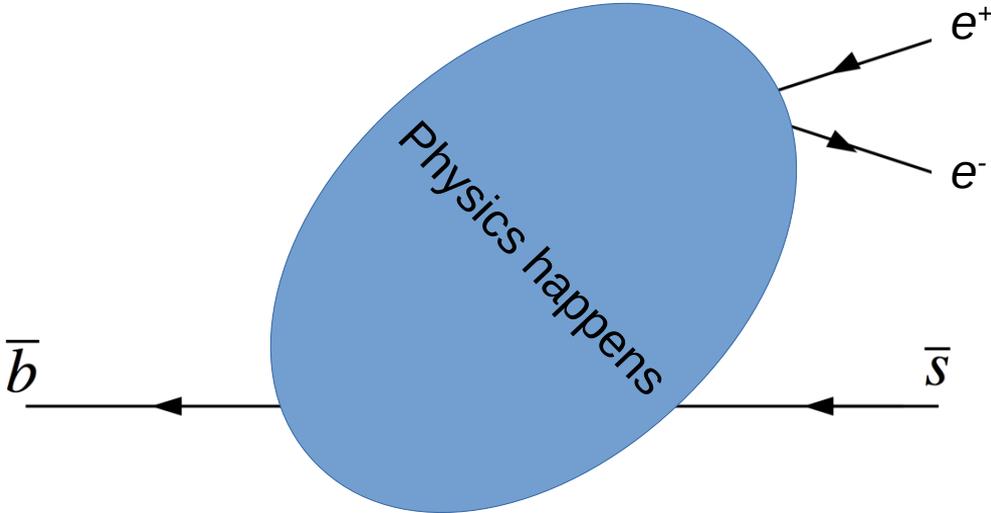
Find differences

- So far, we can only see one difference between the copies:
 - How heavy they are
- I study physics that involves the different copies, in the hope we can find something else

Find differences

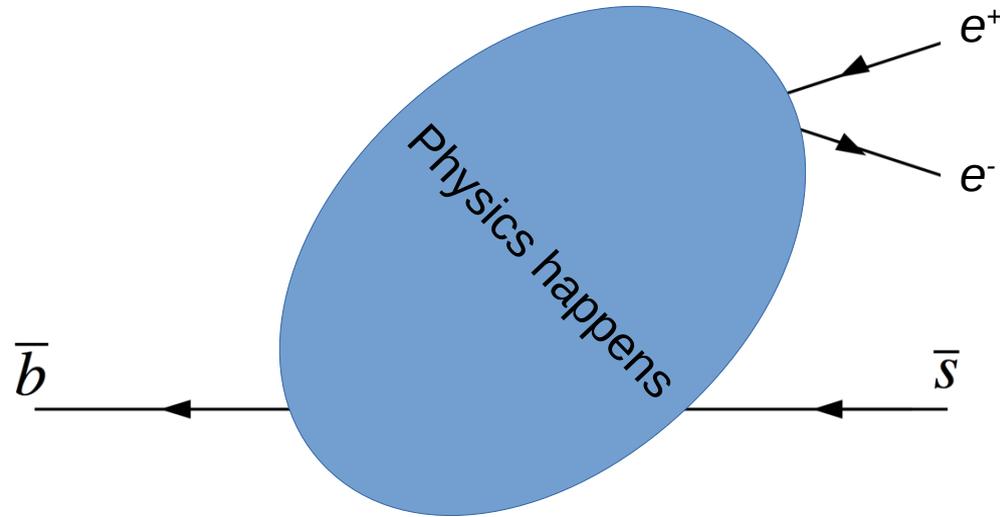


Find differences

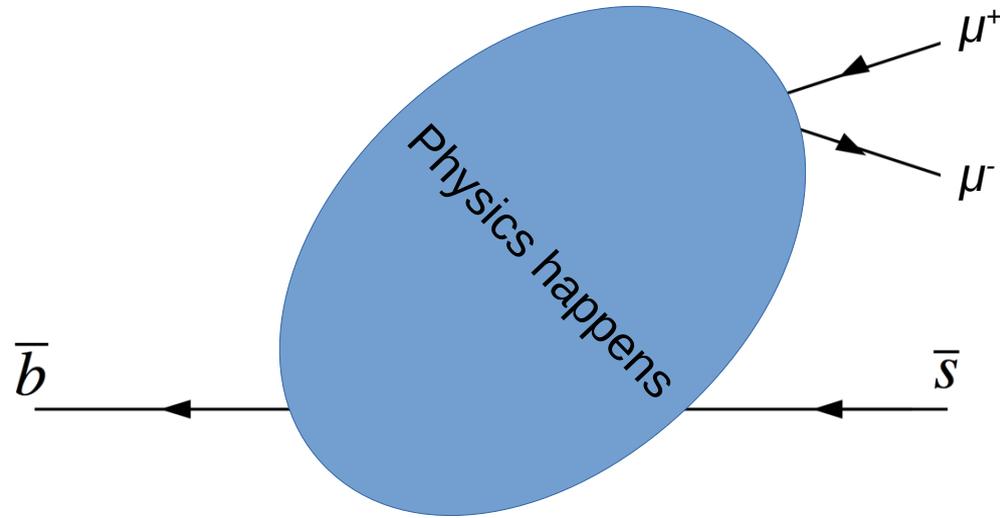


	1 st	2 nd	3 rd
Quarks	u up	c charm	t top
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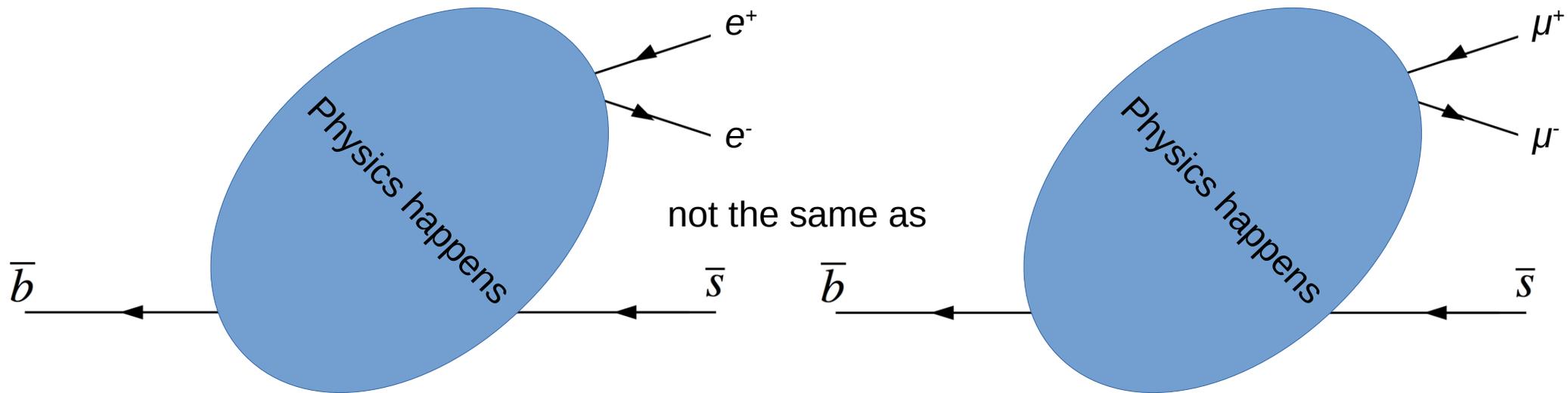
Find differences



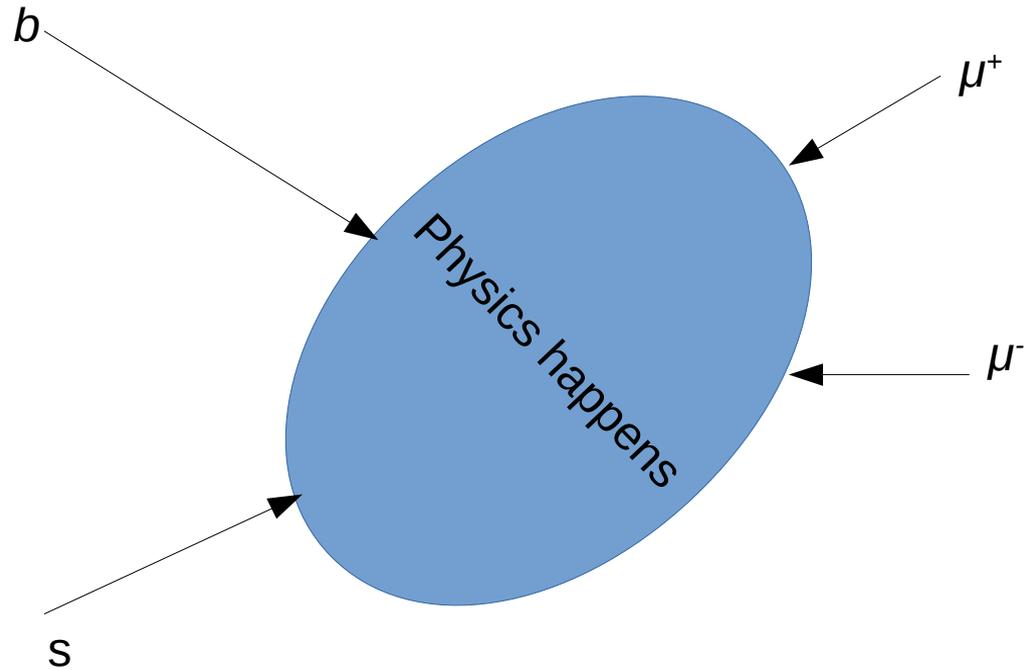
Find differences



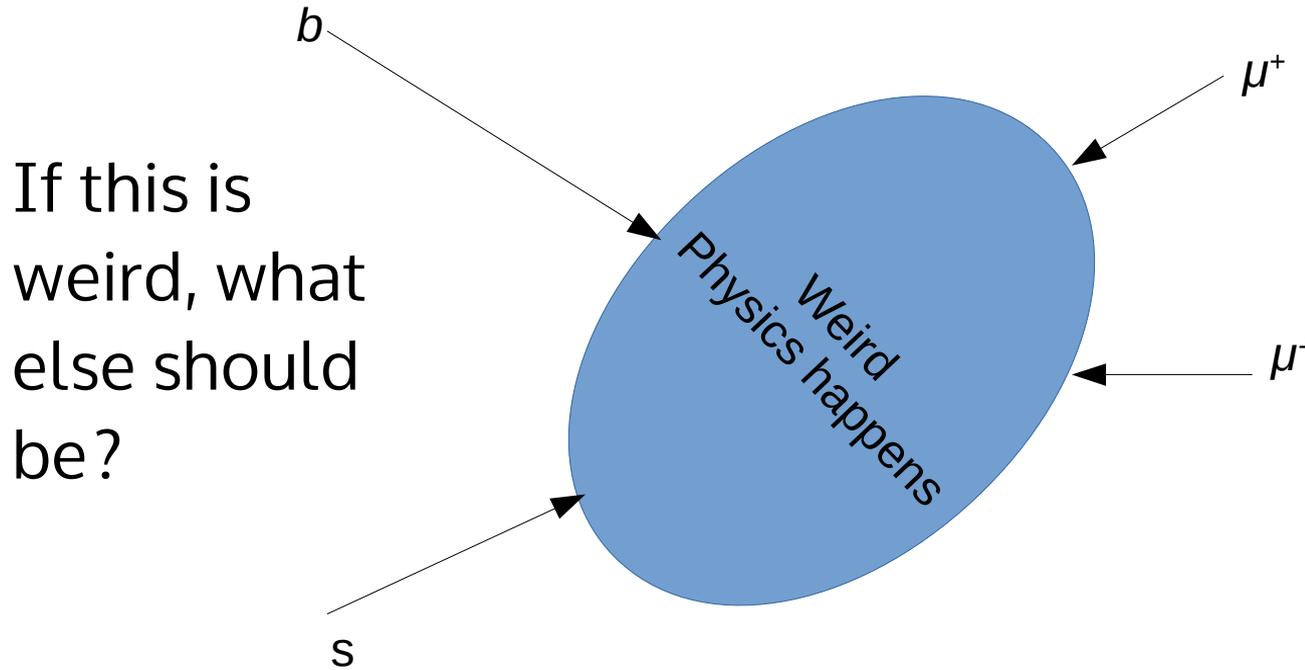
Find differences ✓



But ...

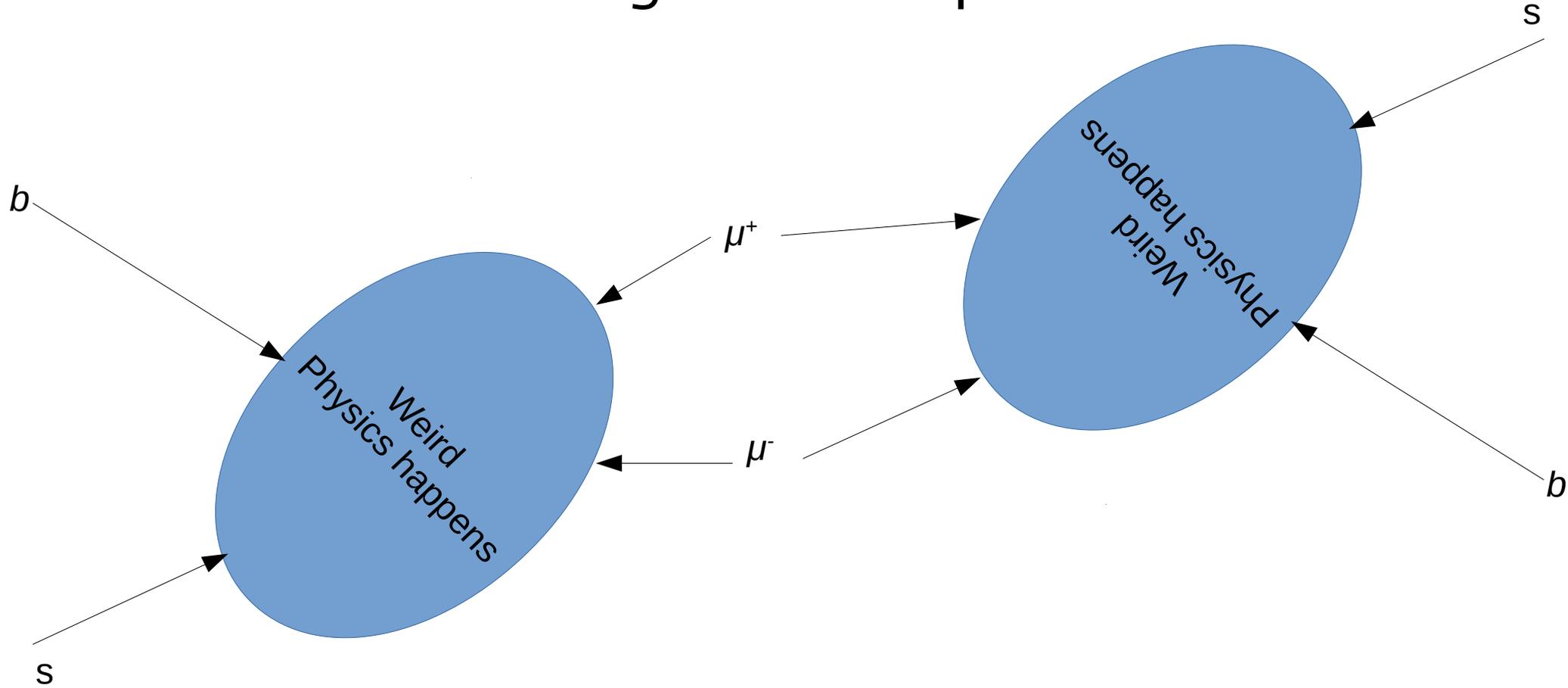


But ...

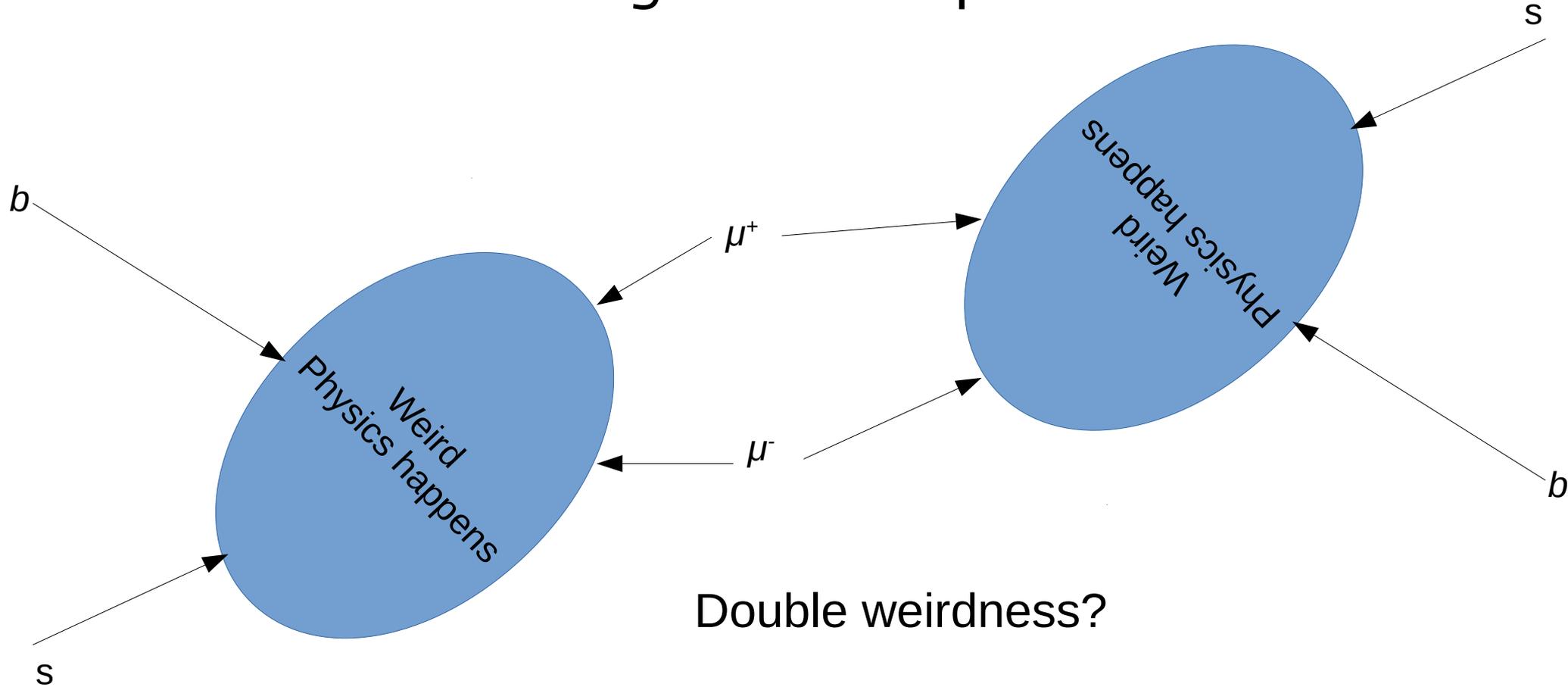


If this is weird, what else should be?

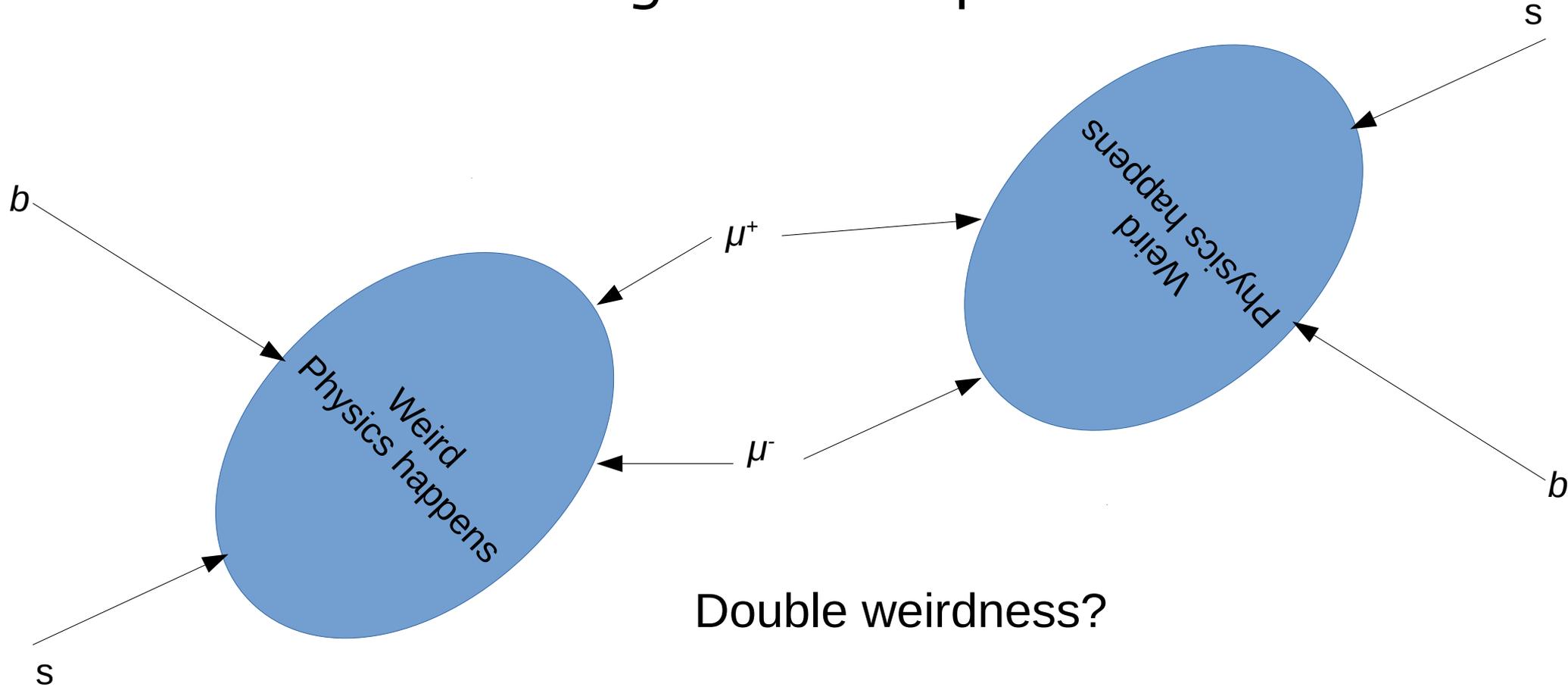
Looking at all the pieces



Looking at all the pieces



Looking at all the pieces



Thanks!