









## Now we do know EM!

- One kind of charge (*electric charge*), of which we can have excess (+) or defect (-)
- Force aríses from exchange of *photons,* that are born from charges, and carry energy to another charge where they díe.

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## What if... 3 charges?

Neutrality (neither excess nor defect) of these color charges is got from:

color+antí-color

- red+green+blue since anti-red=cyan=green+blue
- Sínce in EM where we find particles is in <mark>neutral</mark> arrangements (<mark>atoms</mark>), if we find these special charges will be in <mark>neutral</mark> arrangements too! (*hadrons*: two or three particles with color)























## What if... heavy "photon"?

- Have seen that Ws turn into quark and antiquark, or leptons (e.g. muon plus neutrino)
- Z.s are a bit different: turn into particle plus its antiparticle (eg u and anti-u, electron and anti-electron, neutrino and anti-neutrino).
- Also, a particle doesn't change when emitting a Z.

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Recap...
 The world of particles works vith variations of EM!
 EM: 1 kind of charge, transmitted by photons
 Strong: 3 kinds of charge, exchange gluons
 Weak: 2 kinds of charge, heavy particles Z, W
 Still many puzzles! Generations, mass of particles, why matter and anti-matter not same...
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