

NEUTRINOS, THIS SURPRISING ELEMENTARY PARTICLE

Let us introduce you to: the neutrino, one of the most mysterious particles of the so-called Standard Model of Particles.

You already know some of the particles inside of this model, for example the electron, gravitating around the nucleus of every atom, or the proton and neutron which stick together to build the nuclei of matter, or the famous Higgs Boson whose discovery was awarded a Nobel Prize in 2013.

The neutrino is one of the elementary bricks of our Universe. Similarly to the electron, the neutrino cannot be split into smaller units.

Neutrinos are 'neutral' particles: they do not carry any electric charge while the electrons, for example, have a negative charge.

Our favourite particles come in three different flavours (yes, like... ice-cream!): a neutrino can have an electron, muon, or tau flavour. (Muons and taus are particles very similar to electrons, but heavier.)

A neutrino will be differently produced as a function of the flavour, and the results of its interaction with the matter around us will also change as a function of its flavour.

However, unless ice-cream, neutrinos can change their flavour when travelling towards us, with a mechanism, called *neutrino oscillation*, which is still to a large extent mysterious for us.

How many neutrinos are we talking about?

The neutrino is the second most abundant particle in our Universe.

Every second, about 100 trillion of neutrinos are crossing your body. While you are reading this sentence, 600,000,000,000,000 neutrinos went through you! Did you feel anything?

We bet you did not! This is because of the intrinsic nature of neutrinos. They only interact weakly with the world around us, only one time over one billion in our huge detectors.

Physicists need to play around with this characteristic: sometimes it makes our life hard, to detect it for example, sometimes it helps us to look even deeper into the core of the stars. Curious? No worries, we will tell you everything you want to know!

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ID card of the neutrino

- **electric charge** = 0
- **mass** = not 0 but very, very small
- **origin** = from everywhere!
- **flavours** = either electron, or muon, or tau
- **speed** = very close to the speed of light in vacuum (which is the maximum speed ever reachable in our Universe)
- **energy** = from eV to EeV

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