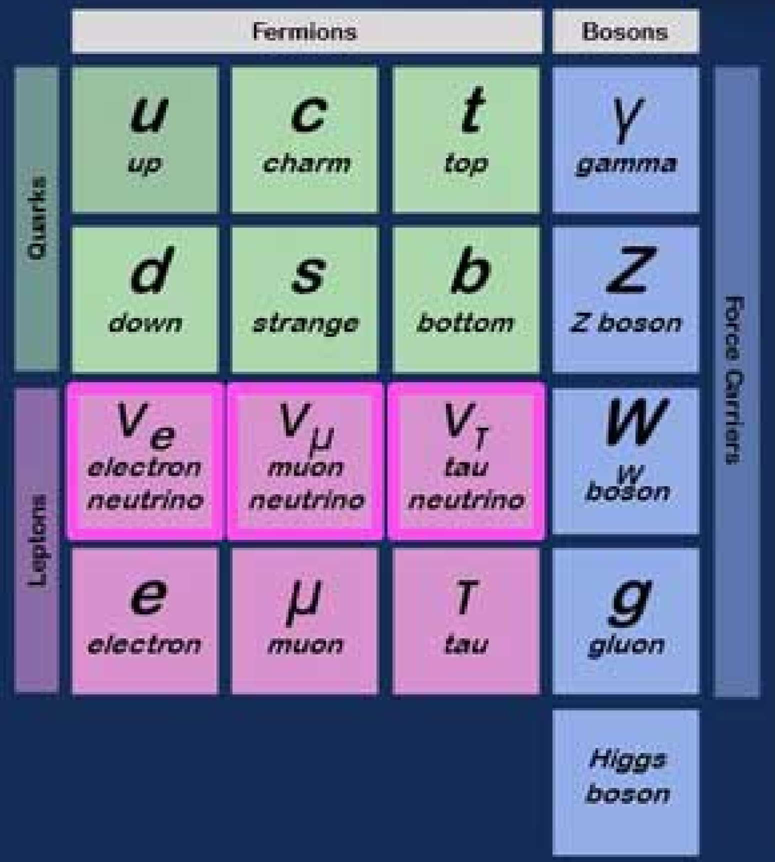
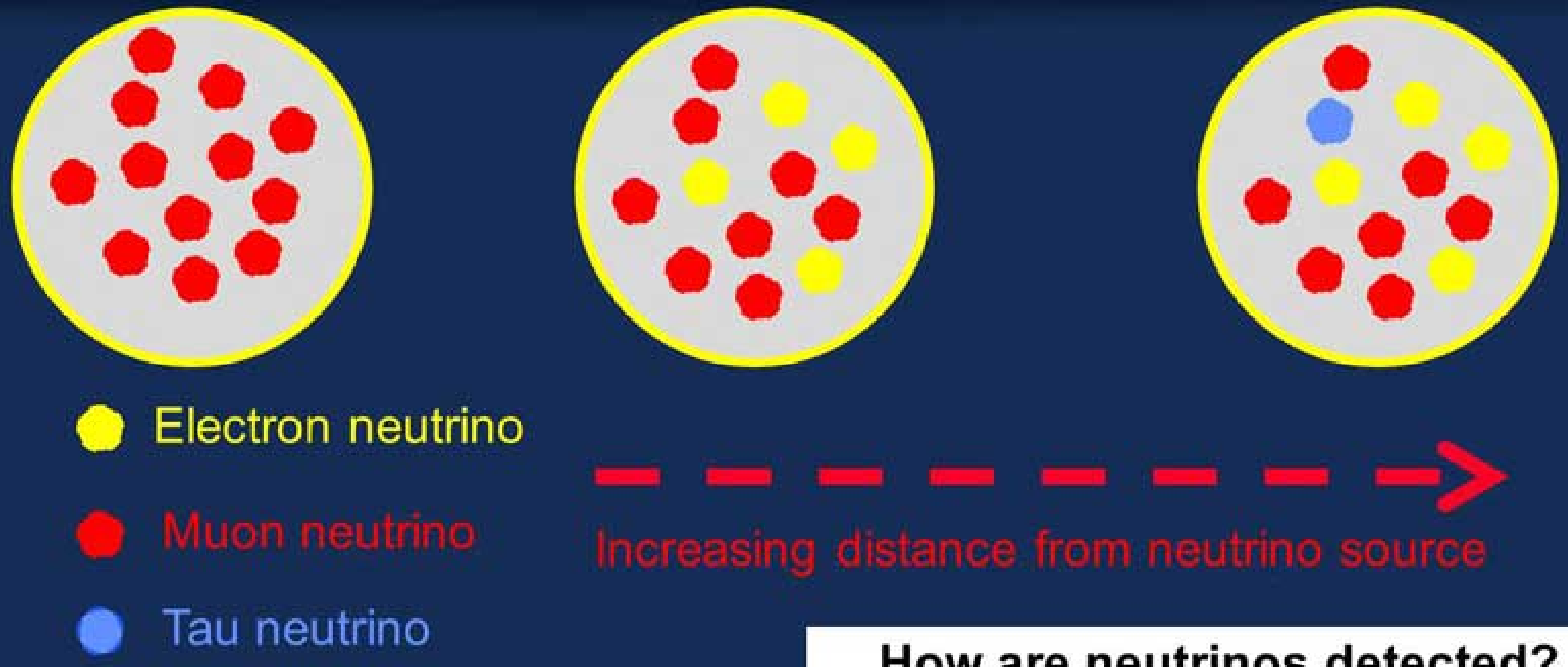
Neutrinos



Neutrinos

Neutrinos are fundamental particles which means that, like quarks, photons and electrons, they cannot be broken down into smaller pieces. They have no charge, and have very little mass which means they travel close to the speed of light. They come in 3 flavours: electron, muon and tau.

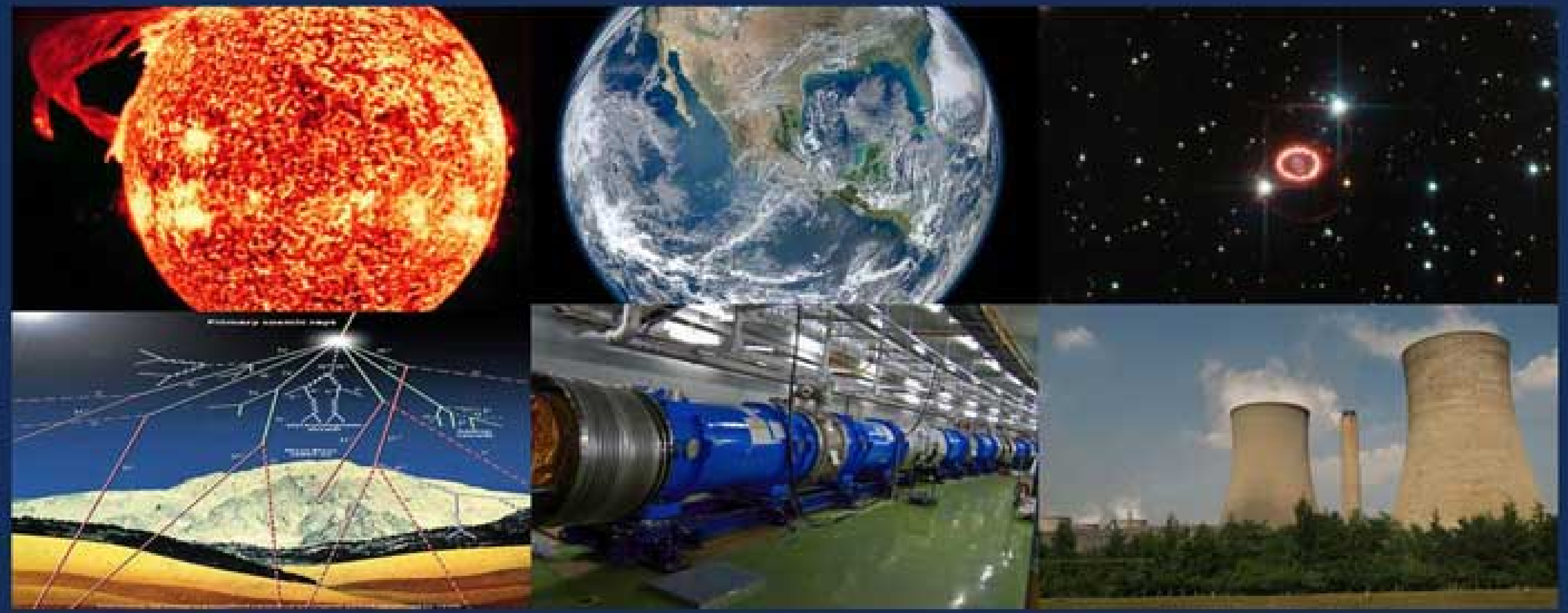


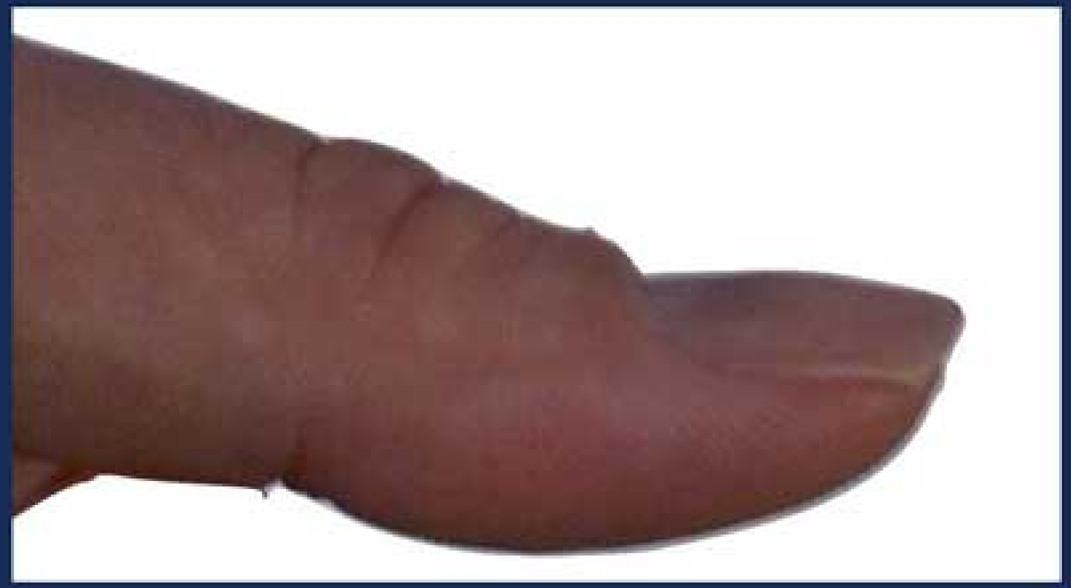
Neutrino oscillations

One of the strangest aspects of neutrinos is that they do not pick a flavour and remain that flavour. Instead, neutrinos oscillate between the 3 flavours as they travel. The discovery of neutrino oscillations implies that neutrinos have mass. Moreover, as the standard model of particle physics predicts that neutrinos should have no mass, new theories must developed and tested to explain why they have mass. The 2015 Nobel Prize in physics was awarded for this discovery.

Abundant but elusive

Of particles with mass they are the most abundant in the universe. Despite their abundance they interact very weakly with matter. Roughly 100 billion pass through your thumbnail every second without you ever noticing.





Where do they come from?

Neutrinos are produced in many processes in nature. They are produced in nuclear reactions in the sun, nuclear decays in the earth, in supernovae and due to cosmic ray striking earths atmosphere. They are also produced by accelerators and nuclear power plants.

How are neutrinos detected?

To detect neutrinos very large detectors are needed as only a tiny fraction of neutrinos passing through the detector will interact with it. Modern neutrino detectors are very large, and even larger ones are planned for the future.