

name	relative strength	range	key features
Strong Force ("Strong Interactions")	1	short	<ul style="list-style-type: none"> • generally attractive • binds quarks in proton & neutron • binds protons & neutrons in nucleus • source of nuclear energy, energy of Sun, (most) stars
Electro-Magnetism	$10^{-2} = \frac{1}{100}$	long	<ul style="list-style-type: none"> • has two types of charge: + and - • opposite charges attract • same sign charges repel • neutrality (canceling charges) possible • binds electrons to nucleus in atoms • responsible for all of chemistry • causes "Coulomb barrier" in nuclear reactions
Weak Force ("Weak Interactions")	very weak, but comparable to EM at distance $\frac{1}{400}$ of proton diameter	very short	<ul style="list-style-type: none"> • responsible for change in particle type • <i>e.g.</i>: $n \rightarrow p + e^- + \bar{\nu}$ (neutron decay) $p + e^- \rightarrow n + \nu$ (in supernovas) $p + p \rightarrow D + e^+ + \bar{\nu}$ (in Sun, stars) • treats matter & antimatter differently (Baryogenesis??)
Gravity	10^{-38}	long	<ul style="list-style-type: none"> • attractive between any 2 particles • significant only with large clumps of matter • holds Earth together • holds solar system, Sun, stars together • holds galaxies & galactic clusters together • energy source for very young stars ("T-Tauri" stars) • responsible for all large-scale structure in universe • Einstein: gravity due to curvature of space & time ("General Relativity")

Table 1: The four fundamental forces, listed from strongest to weakest, and their properties. Except where otherwise indicated, relative strength is defined for two touching protons.