Fission is a nuclear process in which a heavy nucleus splits into two smaller nuclei. An example of a fission reaction that was used in the first atomic bomb and is still used in nuclear reactors is represented in the diagram below.

The products shown above are only one set of many possible product nuclei. Fission reactions can produce any combination of lighter nuclei so long as the number of protons and neutrons in the products sum up to those in the initial fissioning nucleus. A great amount of energy can be released in fission because for heavy nuclei, the summed masses of the lighter product nuclei is less than the mass of the fissioning nucleus.

Fission occurs because of the electrostatic repulsion created by the large number of positively charged protons contained in a heavy nucleus. Two smaller nuclei have less internal electrostatic repulsion than one larger nucleus. So, once the larger nucleus can overcome the strong nuclear force which holds it together, it can fission. Fission can be seen as a “tug-of-war” between the strong attractive nuclear force and the repulsive electrostatic force. In fission reactions, electrostatic repulsion wins.

Fission is a process that has been occurring in the universe for billions of years. As mentioned above, we have not only used fission to produce energy for nuclear bombs, but we also use fission peacefully everyday to produce energy in nuclear power plants and fission-track dating.

Source: (text modified from) http://www.lbl.gov/abc/Basic.html#Fission
(upper figure) http://ccnr.org/fission_ana.html