Nuclear Fission

- Some nuclides can break apart (undergo fission) when bombarded with neutrons
- Mass of reactants > mass of products
  - ↳ missing mass is converted to energy
- Nucleus can split in many ways (Ex. U-235 can result in many rxns)

$$^{235}_{92}U + ^{1}_{0}n \rightarrow [^{236}_{92}U] \rightarrow {}^{140}_{56}Ba + {}^{93}_{36}Kr + 3\,{}^{1}_{0}n$$

$$[^{236}_{92}U] \rightarrow {}^{144}_{55}Cs + {}^{90}_{37}Rb + 2\,{}^{1}_{0}n$$

$$[^{236}_{92}U] \rightarrow {}^{144}_{54}Xe + {}^{90}_{38}Sr + 2\,{}^{1}_{0}n$$

$$^{160}_{62}Sm + {}^{72}_{30}Zn + 4\,{}^{1}_{0}n \rightarrow {}^{146}_{57}La + {}^{87}_{35}Br + 3\,{}^{1}_{0}n$$

- Start of the process: bombardment of the radioactive nuclide with a neutron starts the process
- Neutrons released in the transmutation strike other nuclei, causing their decay and the production of more neutrons → chain reaction
- Critical mass: minimum mass that can sustain chain reaction
- Nuclear weapons contain separate subcritical amounts of fissionable isotope
  - → amounts driven together to create critical mass upon detonation