February 11, 2021
MSE 2103 topics

- The math behind radioactive decay – part 2

  ○ $^{137}$Cs has a half-life of 30.17 years as it decays into $^{137}$Ba. Jow much Cs is left after 50 years? How much Ba is produced after 75 years?

  ○ $^{238}$U has a half-life of ~4.5 billion years. A rock from lunar highlands shows that 45% of the original uranium decayed into lead. How old is that rock?

  ○ Determine the half-life of $^{40}$K if you know that there is ~9% of primordial potassium left in an asteroid that is ~4.5 billion years old.

- Lines of evidence for a 4.6 billion year old Earth

- Fine, Earth is 4.6 billion years old; but what about the Sun?
  ○ chemical reactions, fossil fuel burning?
  ○ radioactive decay?
  ○ gravitational contraction?
  ○ … or something else?

- $E = mc^2$

- Eddington's model (from Einstein's mass-energy equivalence)

- The proton-proton chain: p+p → p+n → p+p+n *2 → He-4

- … except… how do protons overcome extreme requirements?