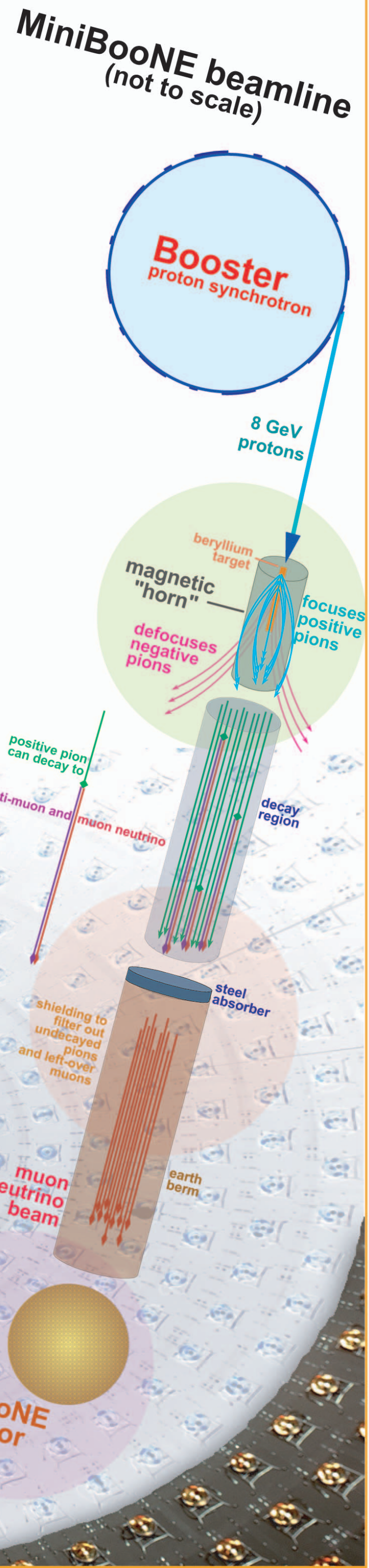
Recipe for a Neutrino Beam

– cooking time: one ten-millionth of a second

Whenever the weak force breaks up a nucleus, you will always find a neutrino among the pieces. Leptons are like salt and pepper – they're always produced in pairs. If a nuclear breakup makes an electron, there will be an electron anti-neutrino there, too. When a heavier particle called a pion comes unglued, it makes an anti-muon and a muon neutrino.

Electron neutrinos abound on the Earth, from the Sun and other terrestrial origins. MiniBooNE, though, needs a focused neutrino source. Back in the late 1950's, scientists at Brookhaven National Laboratory allowed a collected stream of pions to decay, and concocted the world's first neutrino beam. Beam chefs here at Fermilab take protons from the Booster and slam them into a chunk of beryllium. A magnetic concentrator called a "horn" focuses the resulting swarm of charged pions and steers them toward the MiniBooNE detector. The pions decay en route, the muons are filtered out, and voilà! Neutrinos à la carte.



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