

- 1.) Mu-meson are produced when cosmic radiation interacts with atoms in the earth's upper atmosphere.
- 2.) They have a half-life of approximately 2 microseconds and move at close to the speed of light.
- 3.) This means that if nothing else was going on, they would travel around 600 meters before decaying into other subatomic particles.
- 4.) By extension, this means that if nothing else is going on, there should be very few mu-mesons close to the surface of the earth. In fact, though, there are an enormous number at sea level.
- 5.) So what's going on if the mu-meson is observed from the earth's frame of reference?
  - a.) From the earth's perspective, time dilation will lengthen the time of flight of the mu-mesons thereby allowing them to travel longer than one might expect.
  - b.) From the mu-meson's perspective, length contraction will shorten the distance required to travel to get to the earth's surface, therefore allowing the mu-mesons to get farther than expected.
  - c.) In both cases, relativistic effects explain the situation.