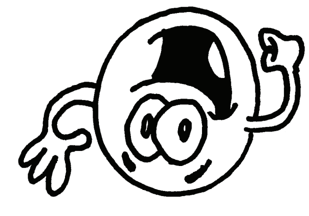
COSMIC RAYS!

An astronaut in deep space would have thousands of subatomic particles pass through his or her body every second!

Thankfully, Earth's atmosphere and magnetic field protect those of us on the ground from these particles called...

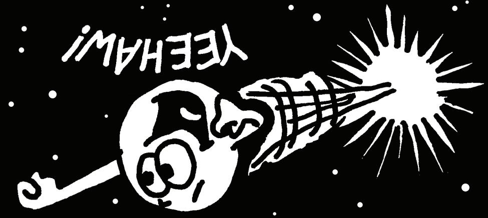
My name is Ray, and I'm a cosmic ray. See that dot? That's **not** me. Cosmic rays are so small that 10^{21} (1 followed by 21 zeros) of us could fit inside that dot! That's because most of us are protons.

This is better. I've been magnified so you can actually see me!

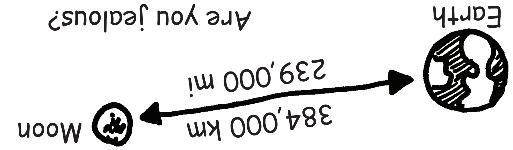


So, you're probably wondering what makes cosmic rays so special.

The main reason is our speed--almost the speed of light! Most of us get our speed from exploding stars called supernovas. Others get it from eruptions on the Sun.

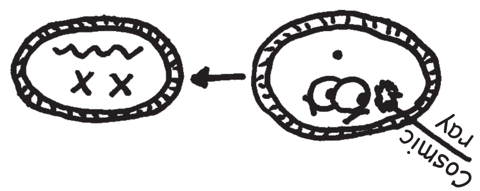


We're so fast that one of us could have flown to the Moon and back two times by the time you finish this sentence!

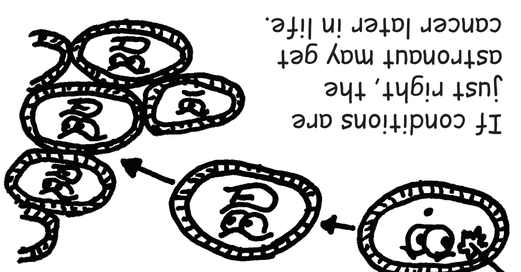


Are you jealous?

Our speed makes us dangerous to astronauts. They can't feel us, but we can hit some of their cells. The damaged cells usually die.



Sometimes, though, the cells will malfunction.

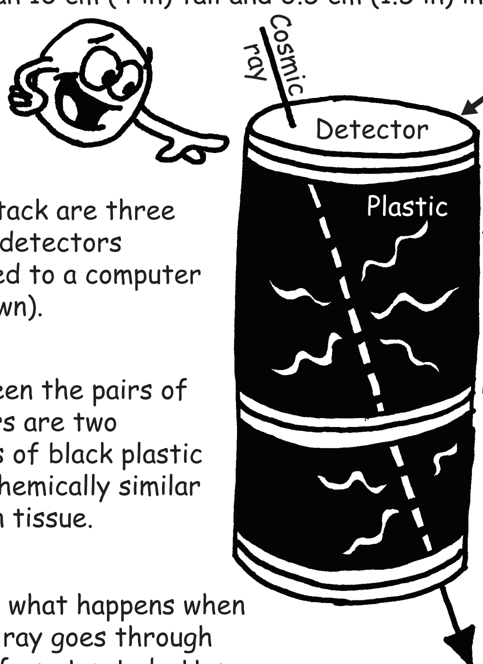


If conditions are just right, the astronaut may get cancer later in life.

Scientists study the health risk from cosmic rays using the Lunar Reconnaissance Orbiter (LRO for short). LRO is a NASA spacecraft that has been circling the Moon since June 2009.

On it is a shoebox-sized instrument called the Cosmic Ray Telescope for the Effects of Radiation (CRaTER for short). CRaTER helps scientists understand how cosmic rays affect humans in space.

Here's how CRaTER works. Inside it is a cylindrical stack that is a little more than 10 cm (4 in) tall and 3.5 cm (1.5 in) in diameter.



In the stack are three pairs of detectors connected to a computer (not shown).

In between the pairs of detectors are two cylinders of black plastic that is chemically similar to human tissue.

Let's see what happens when a cosmic ray goes through CRaTER from top to bottom.

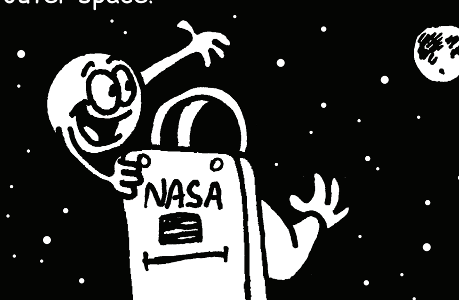
1) The first pair of detectors senses the cosmic ray's energy.

2) The cosmic ray deposits some of its energy in the plastic.

3) The second pair of detectors senses that the cosmic ray has less energy than when it started. Steps 2-3 repeat for the rest of the stack.

The difference between the cosmic ray's starting and ending energies is the energy given to the plastic.

Because the plastic is like human tissue, the energy added to the plastic is the radiation dose in the human body! By knowing more about the risk from cosmic rays, NASA can better protect future astronauts as they explore outer space!



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For more informatio about CRaTER:
http://crater.sr.unh.edu
For more information about LRO:
http://lro.gsfc.nasa.gov