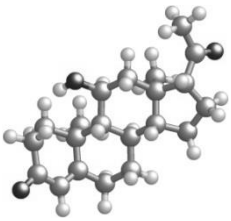

Chem!stry

Name: …… **( )**

Class: ……

Date: …… **/** …… **/** ……

Stardust to Stardust

The History of a Calcium Atom

Traveller: A calcium atom.
Origin: The first stars.
Destination: Your body and beyond.
Duration: 13.5 billion years.

The calcium in your bones, like every other heavy atom in your body, was forged in the fiery furnace of enormous stars, 10, 100 even 1000 times the mass of the sun. This one, nestled inside your left collarbone, came from one of the universe's very first stars, born 550 million years after the big bang.

When its star burst into a giant supernova, calcium fled the scene like an action hero diving out of an exploding car. It floated through interstellar space for millennia before joining a cloud of gas and dust dense enough to collapse into a new star, also destined to go supernova.

It is a cycle that repeated itself a few times until, some 5 billion years ago, the atom found its way into the cloud that became our solar system. The view from inside the iridescent haze would have been awe-inspiring. Nearby infant stars shone through like floating diamonds, their radiation sculpting the gas and dust into other-worldly sandcastles. Lost in their midst were all the other atoms that would one day coalesce into your body.

Slowly, the haze contracted under its own gravity, compressing the centre until it was hot enough to ignite into the seed of a star. As the gases swirled around our new-born sun, they dragged the calcium atom into a giant spinning disc.

It took a further billion years for Earth to solidify from the cloud, with your calcium atom trapped inside it. And another 4.5 billion years passed before it ended up in the pak choi (Chinese cabbage) you had for dinner the other night. Along the way, it cycled through the Earth's crust and oceans, a limestone cliff and a mollusc shell, until finally there it was in the field, sucked-up through the roots of the Chinese cabbage and onwards to you dinner plate.

You and your collar bone will only be here for a short time, as far as the calcium atom is concerned. One day, it will flow out of the bone, into your blood and return to the earth in urine, where it can help other things grow.

In another 5 billion years or so, the calcium atom will look on as the sun collapses into a dense ball of carbon and oxygen, sloughs off the last of its gas and becomes a cool, puffy old star called a red giant. With time, its core will settle into a dense nugget called a white dwarf. The mass of the entire sun will be squashed into a volume about the size of our planet.

If Earth survives this process, it will quickly become a boring, lifeless rock – which shouldn't bother the calcium atom. Eventually, though, Earth may fall onto the surface of the white dwarf. If they bother to look, alien astronomers will see a smear of calcium in the dead star's spectrum. Our own astronomers have recently found similar signs of heavy elements in the spectra of white dwarfs in our galaxy.

But if the outer layers of the sun were to engulf Earth in its death throes and vaporise it … well, it is just possible that the calcium atom in your collar bone will be carried away as renewed cosmic dust – material for the next generation of stars.

Lisa Grossman, Stardust to Stardust, *New Scientist*, 14th November 2015, page 31.