# Lesson 2: Star Formation

After the Big Bang, for millions of years, the universe was dark. No stars, no light, no warmth. Just vast, drifting clouds of hydrogen and helium gas in the cold and the black. Nothing seemed to be happening. But **gravity** was quietly getting to work, and everything was about to change.

Gravity is a pull that exists between anything that has mass, and everything in the universe has mass. Slowly, inevitably, gravity pulled the gas clouds together. As they collapsed inward, the pressure and temperature at the center climbed higher and higher. When the temperature reached millions of degrees, something extraordinary happened: atoms began smashing together so hard they fused. This is called **nuclear fusion**, and it releases enormous energy. A star switched on. Somewhere in the darkness, the first light appeared.

Stars are the universe's great factories. Inside them, simple hydrogen is hammered by pressure and heat into heavier **elements**: carbon, oxygen, nitrogen, iron. This is not just interesting chemistry. Carbon is the backbone of every living molecule. Oxygen is what your cells burn. Iron carries oxygen through your blood. Everything the universe needed to eventually make life, stars spent billions of years building. The great clouds of gas and dust in space where new stars are born are called **nebulae**, and they are still forming stars today, all across the galaxy.

When a massive star finally runs out of fuel, it does not simply dim. It collapses and then explodes in a spectacular burst called a **supernova**. In that explosion, the heaviest elements are forged, and all the elements the star built over its lifetime are flung outward into space, scattered like seeds. Those atoms drift, drift, drift through the universe. They gather into new clouds. New stars ignite. Planets form. Life begins. The iron in your blood was made inside a star that exploded before our Sun existed. The calcium in your bones, the oxygen in your lungs, the carbon in every cell: all of it came from stars. You are made of stardust. That is not just a beautiful thought. It is one of the most wonderful facts in all of science.