# A strange event

In 1967, a Cambridge University PhD student named Locelyn Bell found something strange in her radio Astronomy Data. A very faint blip coming from one part of the sky that repeated every 1.3 seconds with incredible precision. It was so uniform that Bell and her supervisor, Anthony Hewish, nicknamed their discovery LGM-1 for Little Green Men. They figured out it wasn't really a signal from Alein civilization but how else to explain such an astoundingly regular signal from space.

# A Supernova

In the 1930s, astronomers Volta Badda and Fritz Zwicky were searching for an explanation for supernova which is a stupendous explosion that makes the death of some stars and which can for a little while at least outshines the entire galaxy. When the subatomic particle called the neutron was discovered in 1932, Badda and Zwichy realized it could solve their problem. They suggested when an old star runs out of fuel, it rapidly collapses under its own gravity. The star's core suddenly transforms into a super-dense ball of neutrons, and the outer layers of the star bounce in a massive explosion of light and energy, a supernova. The dense core that remains behind, dubs a neutron star, would have the mass of two or three suns squeezed down into the size of a large city.

# A theoretical explanation

Until the 1960s, neutron stars were assumed to be too dim to be seen by a telescope. But in the 1960s, astronomers realized that when a star suddenly collapses like this, two interesting things can happen. Stars typically rotate once every few days. The law of conservation of angular momentum says, that when a star collapses the rotation speeds up.

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Why? w1 \* l1 = w2 \* l2.

Considering, l = (mr^2 / g) where g is the radius of gyration (a constant).

We have, w1 \* (mr1^2 / g) = w2 \* (mr2^2 / g)

=> w2 = w1 \* ( r1 / r2 )^2.

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Now, the collapsed star has r2 << r1 which means its angular momentum increases by a large factor. So, a neutron star can be spinning anything from a time period of 1 second to tens or even hundreds seconds. Also, like earth, a star has its own magnetic field and when it collapses, it takes its magnetic fields with it. This creates incredibly intense magnetic fields. Charged particles in a super-hot plasma surrounding a neutron star, would get funnelled towards the stars magnetic poles and shot out into space as two intense beams. Put these two ideas together, and a neutron star becomes a bit like a lighthouse, rapidly spinning in space, flashing its energy beam across the universe. And suddenly the signal that Bell and Hewish found with their radio telescope made sense. Regular pulses they saw with beams of a spinning neutron star sweeping past the Earth every 1.3 seconds. When they and the other astronomers looked around the sky, they found more spinning neutron stars. Some of it was slower and some were faster. They called them **Pulsars**.