Jocelyn Bell Burnell

This British astrophysicist helped uncover the mysteries of space.

For a species that's never been farther than the Moon, we know lots about space. We owe our knowledge to a handful of brilliant minds – the heroes of science. Among them is Jocelyn Bell Burnell, whose discovery of a totally new type of star more than 50 years ago has widened our understanding of our universe and the wonders it holds.

Bell Burnell grew up in County Armagh, in Northern Ireland. Her father was an architect who was interested in lots of different things. Bell Burnell credits his influence with inspiring an early love of astronomy. "He bought all sorts of books," she later remembered, "but it was the astronomy ones that actually got my attention." Bell Burnell also says she has a teacher to thank for her passion for physics. "He was a really good teacher and showed me, actually, how easy physics was." She became so enthusiastic about the subject that she went to the University of Glasgow to study it, and from there to the University of Cambridge to continue her research.

It was at Cambridge that she made the discovery that would change our understanding of space. As part of her research, Bell Burnell helped to build a radio telescope – a device for looking at radio waves from outer space. Many radio telescopes are dish-shaped, but this one was formed of wires strung between poles in a field. Bell Burnell spent almost two years putting up the wire and hammering in the posts herself.

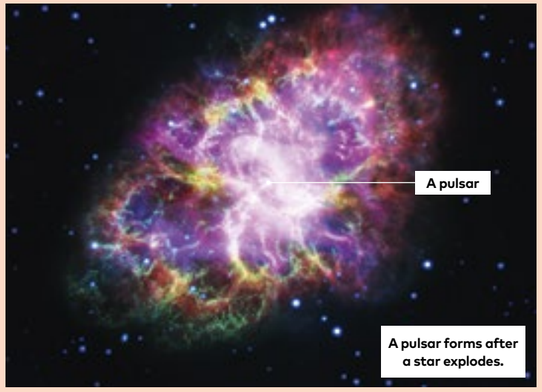
The telescope was built to research quasars – gigantic and mysterious objects in space, which are so bright that they outshine the galaxy that contains them. By 1967, it was ready. The telescope recorded its results on long rolls of paper, and as she pored over them, Bell Burnell made her discovery. She noticed an unusual, throbbing signal coming from a point in the sky. The signal would pulse on and off every 1.3 seconds. It was so out of the ordinary that she and her colleagues jokingly christened it "LGM-1", which stood for Little Green Man. They thought it might be a message from an alien planet.

In fact, what Bell Burnell was seeing was a pulsar. This strange object is created when a giant star dies in a massive explosion (see box below). Bell Burnell's adviser, Antony Hewish, later won a Nobel prize for the discovery, and although Bell Burnell didn't, her career has been remarkable. She served as the first ever female president of the Institute of Physics. This year, she was awarded a Breakthrough Prize worth £2.3 million for her work, and is giving it all away. She will donate the prize money to help women, people from minority backgrounds and refugees to become physics researchers. With this project she hopes to inspire and educate a new generation of science heroes.

Her legacy, meanwhile, will endure far into the future. It's hoped that one day, signals from pulsars will help astronauts find their way as they explore the outer reaches of space.

Pulses from space

A pulsar is created when a giant star dies in a supernova – the largest kind of explosion in space. What is left behind is a super-compact, super-heavy star. The forces inside it are so strong that ordinary matter is ripped apart. In the blast, the electrons and protons inside atoms are crushed together to make neutrons – subatomic particles with no electrical charge. Neutron stars are only about 12 miles across (roughly the size of London), but their mass is about 1.4 times that of our Sun. Unbelievably powerful magnetic fields blast beams of particles and energy out into space from opposite poles on the neutron star. Because the stars spin so fast (they can spin between seven and 40,000 times in one minute), from Earth the beams of particles and energy seem to blink on and off. This is what Jocelyn Bell Burnell spotted. Pulsars are useful because they spin so regularly that they actually keep time better than man-made clocks. They are also at fixed points in space, which means that one day they could help people map the universe.



A pulsar forms after a star explodes.

NERD WORD

QUASARS

Quasars are among the brightest objects in the universe. They are thought to be powered by supermassive black holes, at the centre of large galaxies.

NO NOBEL FOR BELL BURNELL

Bell Burnell wasn't given a Nobel prize but her supervisor was. Some say this shows sexism in physics, although others say that students aren't usually given prizes because their supervisor directs their research.

IS ANYBODY OUT THERE?

In the 1970s, astronomers made a map using pulsars as landmarks and sent it into space, in the hope that intelligent life might find its way to Earth.

ONE LUMP OR TWO

Pulsars are so dense that one sugar-cube-sized lump would weigh a billion tonnes – about the same as Mount Everest.

Jocelyn Bell Burnell changed our understanding of space.