# Night Life

**Richard Massey** tells **Chris Bramley** about plans to celebrate the 90th anniversary of Eddington's famous experiment on an African island

This month we're commemorating the 90th anniversary of arguably the most important experiment of the 20th century. It was carried out by Sir Arthur Eddington and it was the first time Albert Einstein's theory of general relativity was verified. The experiment confirmed that the way we think about how the Universe operates had changed forever.

Eddington's experiment involved observing a solar eclipse to test a prediction of general relativity. This states that light rays don't actually travel in straight lines, but can be bent when gravity bends space and time, warping the whole fabric of the Universe. We can see this effect as a star's light coming from a different direction than it really is – the star appears to move slightly in the sky. It's an effect called gravitational lensing.

Scientists thought that they might be able to look at stars just behind Jupiter to observe warped light rays, but Jupiter turned out to not be massive enough to deflect light. The only other option was to look at stars just behind the Sun and see if they moved slightly. Ordinarily, the Sun is too bright to see stars right next to it, which means that you have to wait for a solar eclipse. There was a bit of a wait for such an event, because Einstein published his theory of general relativity in the middle of the First World War in 1915, and the first solar eclipse after the War was in 1919. However, it was a particularly good one because it occurred right in front of the Hyades star cluster, a dense group of stars. Eddington needed a lot of stars to see whether they moved or not.

He had to travel to where the eclipse was visible, which meant going to the island of Príncipe in West Africa. His experiment had to be flawless. For a start, he sent another expedition to Brazil, which was also in the path of the eclipse, and he also took images of a second bunch of stars that didn't have the Sun in front of them to show that any movement of the stars wasn't caused by his telescope.

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Eddington's experiment received a lot of attention at the time and was largely responsible for Einstein's fame. Before it, Einstein was known in scientific circles but not in the larger public context. It was quite a dramatic thing to sail around the world and come back with results verifying that Einstein was right and that he was responsible for changing our view of the world. Many of the newspapers of the time ran big spreads on the experiment.

**About Richard Massey**

Richard is a STFC advanced fellow in astronomy at the Royal Observatory Edinburgh. In his research he has worked with the Herschel, Subaru, Keck and Hubble telescopes to study the distribution of dark matter in the Universe.

We're going to commemorate its importance 90 years on by going out to Príncipe for the anniversary. It's not quite as challenging to get to as it was in Eddington's time. Back then it took him a month and a half by ship. Still, it's not the most convenient place in the world to get to even today; there's only one flight a week, and you've got to stop off on the African mainland. We've met with the island's governor, and he's keen to back the commemoration as a way to bring overseas investment and tourism to the island.

We're going to lay a plaque on 29 May at the place where Eddington carried out his experiment, hold a commemoration ceremony and give a series of talks. I'm particularly keen to see the plaque unveiled because I designed it. On the way out we're also going to be speaking in Lisbon, because we've partnered with the Portuguese ministry of science – Príncipe used to be a Portuguese colony. We've also got an exhibition planned in the island's capital São Tomé, explaining what gravitational lensing is all about.

### An astronomical legacy

I got involved with the commemoration because I use gravitational lensing every day to do my own research into dark matter, and I was interested in finding out where the first detection of this effect happened. In the same way that Eddington observed light from the Hyades stars bending as it travelled past the Sun, I look at the light from very distant galaxies and observe how it's bent as it traverses vast regions of space, which crucially contain dark matter. Even though we can't see the dark matter, it does have mass, which bends the light from these distant galaxies so that they appear distorted. By measuring the shape of these galaxies we've been able to pinpoint where this dark matter is in the Universe.

Gravitational lensing was a novelty for Einstein and Eddington, and they didn't particularly see a use for it beyond the fact that it was a means to prove Einstein's theory. Today, it's the best way of finding out more about the most common and mysterious ingredient in the Universe: dark matter. ✪