

SHE'S A STAR (GAZER)

By day Jo Dunkley attempts to understand the origins of our universe, but as night falls she takes to the screen to explain cosmology for the BBC, she tells *Jamie Condliffe*



The University's Sub-department of Astrophysics may spend its days looking at stars, but it's fast creating them, too. Take Dr Jo Dunkley: an award-winning academic, she now makes regular appearances on the BBC.

It's perhaps not surprising that she's so adept at explaining complex science to TV audiences. Asked about what her research involves, she casually replies that she 'tries to understand the origins and structure of the universe', before enthusiastically explaining just what that entails with great clarity.

Dr Dunkley spends her time analysing the Cosmic Microwave Background, which is part of the electromagnetic spectrum travelling through space. 'It's the most distant light you can see – an image of the universe when it was born,' she explains. 'I don't build experiments, though. I'm a theorist who analyses data. My job is to turn recorded maps of that light into properties of the universe: how old it is, how much it weighs, or what it's made of.'

That's not a particularly straightforward task. It involves creating thousands of models of possible scenarios of how the universe could have turned out, then slavishly comparing them to reality. 'We compare our experimental data to millions of theoretical universes,' she says. 'Until, eventually, we find one which matches.'

After studying Natural Sciences at Trinity Hall, Cambridge, Dunkley arrived in Oxford in 2002 to undertake her DPhil in astrophysics. 'I just thought it was really neat that by pointing telescopes at the sky we could figure out the behaviour of the universe,' she recalls. After a brief spell as a Research

Fellow at Princeton University, where she worked on NASA's WMAP satellite science team, she returned to Oxford in 2007 and is now a University Lecturer in Astrophysics and Tutorial Fellow at Exeter College.

Since then, she's been involved with two large-scale international projects, analysing data from both the European Space Agency's Planck satellite, which orbits the Sun between Earth and Mars, and the Atacama Cosmology Telescope, which sits atop Cerro Toco in Chile and is one of highest observatories on the planet. Both yield rich and complex data, which Dunkley and her research group interrogate to learn about the universe's origins.

'Right now, I'm personally super-excited about our new work on gravitational lensing'

Working with data from Planck, Dunkley's team has been probing what happened during the Big Bang. 'We think that during the first trillionth of a second, the universe expanded extremely fast, laying down the seeds for the cosmic structure we see today,' she explains. 'Our analysis confirms many of those theories.' Elsewhere, her work at the Atacama Telescope provides more detailed views of smaller parts of the sky – but, as she points

out, allows her students to get much more involved with the research. 'It's just so much easier for them to get deeply involved and hands-on with a 5-year telescope project in Chile than a 20-year satellite mission in space,' she says.

'Right now, though, I'm personally super-excited about our new work on gravitational lensing,' she adds. The cosmic microwaves she analyses are actually subtly warped as they travel through space and interact with the mysterious substance that is dark matter. The result is a lensing effect that we can observe here on Earth. 'It's the best bet we have of figuring out the structure of the invisible universe,' she enthuses. 'It should help us understand dark matter and energy in the next five to ten years.'

That infectious enthusiasm was fostered years ago, and is being put to ever better use. 'I spent four months giving talks in London schools about cosmology in 2005,' she explains. Now, through giving more talks and training teachers in how to talk about astronomy, she's graduated to the small screen. These days you can see her explaining cosmology on the BBC's *Science Club* and *Stargazing LIVE*. 'I think it's a really important responsibility we have as publicly funded scientists,' she explains. 'But, most importantly, people just want to understand the world we live in and where it all came from. And it's a real privilege to help them.'

▶ Further information at www-astro.physics.ox.ac.uk/~Dunkley