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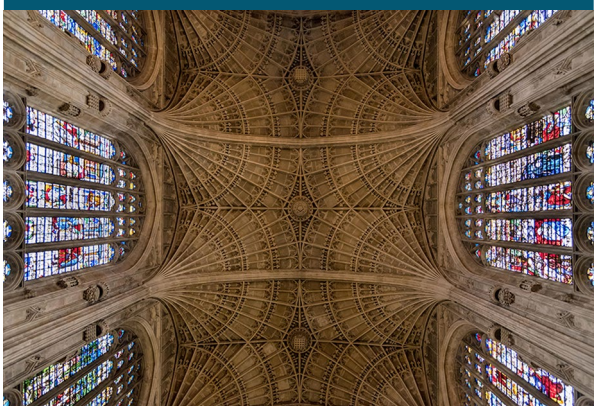
In the news

IN THE BEGINNING



Credit: Ian Littlewood/Alamy Stock Photo

In September, 150 scientists gathered at the Kavli Institute for Cosmology at the University of Cambridge to celebrate the tenth anniversary of the institute, an event marked by a symposium discussing future prospects in cosmology, large-scale structure and galaxy formation.

It has been an exciting decade in cosmology with two Nobel prizes in physics, one awarded this month to James Peebles for theoretical discoveries in physical cosmology. Peebles' work laid the foundation for understanding the cosmic microwave background and its anisotropies, which have been revealed in data from the Planck satellite. Together with other observational and theoretical advances, the Planck data established Lambda Cold Dark Matter as the standard model of cosmology. Despite its success there are a number tensions — the best known being the discrepancies between different measurements of the Hubble constant — that might point to new physics.

Roger Blandford, who chaired the conference summary panel, pointed out that "the quantity and quality of cosmological data are improving dramatically". This is the result of more computing power and enhanced data analysis tools that can tackle the enormous amounts of observational data. But with these new capabilities come the challenges of improving and validating numerical simulations needed to interpret observations.

More data are coming. Multi-messenger observations, in particular those of gravitational waves, are starting to complement traditional cosmological surveys. There are new instruments coming up soon. Scheduled for 2020 are the Dark Energy Spectroscopic Instrument (DESI) and the Background Imaging of Cosmic Extragalactic Polarization (BICEP) Array, and in 2021 the Simons Observatory to study the cosmic microwave background and the James Webb Space Telescope. 2022 will see the Euclid mission, a space telescope to explore dark matter and dark energy.

"This is an exciting time in cosmology and there was significant optimism that we would learn much about the details of inflation, the survival of baryons, the nature of dark matter and our cosmic fate, alongside the no less scientifically interesting palaeontological record of galaxy assembly, structure and evolution," noted Blandford.

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