Probing Universe's first light

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The Cosmic Microwave Background (CMB) is the first light ever emitted in the Universe, only 380 000 years after the Big-Bang. Since its discovery by Penzias and Wilson in 1964, the CMB has been observed, measured and studied by many scientists and many experiments, around the globe and even from space.

Although it looks extremely homogeneous at first sight, the CMB in fact presents small variations depending on the direction of observation, called anisotropies. These anisotropies carry information about the structure of our universe, its energy content and its evolution, making the CMB one of the best probe we have to study the universe.

Recent experiments, in particular the Planck mission, have measured the total intensity of the CMB and its variation across the sky with a very high precision, allowing us to confirm and measure the parameters of the standard cosmology model with a very high accuracy.

Total intensity is however not the only source of information carried by the CMB, since its light is also polarised. This polarisation potentially contains hint for a new physics, in particular of a hypothetical phase called inflation. This phase has been proposed by cosmologists to resolve problems arising in the standard model of cosmology. Polarisation anisotropies are however several order of magnitude below those of total intensity, making them hard to measure.

Cosmologists are therefore building new experiments to observe CMB polarisation with an unprecedented precision, looking for a particular signature in this signal, which would be a smoking gun for inflation.

I will give an overview of Universe history, CMB science, and operation of current and future CMB experiments.

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