The cosmic microwave background (CMB) anisotropies provide a snapshot of the Universe at the time of recombination and their accurate measurements have advanced our understanding of the origin, composition, and evolution of the Universe. However, our view of the primordial Universe is perturbed by the interaction of CMB photons with the intervening matter-energy content. Two physical phenomena stand out. On one hand, the large scale structure deflects the CMB photons’ path through an effect dubbed weak gravitational lensing, providing a wealth of information on the neutrino and dark sector. On the other, more exotic mechanisms such as primordial magnetic fields and parity-violating physics are thought to rotate the polarization plane of CMB photons via so-called cosmic birefringence.

In this talk, I will present two ongoing endeavours carried out with SPTpol, a millimeter-wavelength polarization-sensitive receiver installed on the South Pole Telescope that has surveyed 500 deg$^2$ of the southern sky. I will firstly present a new measurement of the CMB lensing potential power spectrum and its cosmological implications, and then discuss efforts to measure the cosmic birefringence power spectrum. Finally, I will conclude with possibilities that lie ahead with new data coming in from SPT-3G.