Gravitational birefringence of light

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The Souriau-Saturnini equations are solved in a generic Robertson-Walker metric. We learn that the gravitational field of an expanding universe induces birefringence. The two polarisation states of light travel on helices with opposite chirality. The offset between the two trajectories is of the order of the wavelength and the period of the cycles depends on the acceleration of the expansion. A possible detection of this birefringence is discussed.