

NETLINCS - New Trends in Linear and Non-Linear Spectroscopic Studies of Natural Chirality



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A perspective on chiral structured light

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Since the pioneering work by French scientists in the early 1800s, optical activity and chiral light-matter interactions have been produced via the chirality of light stemming from a degree of ellipticity in its local polarisation state. The mechanism is well understood: the polarisation state can rotate in a left or right-handed fashion and leads to differential interactions with left and right-handed materials. Structured light can be chiral in degrees of freedom beyond local polarisation state. Optical vortices, for example, possess a chiral wavefront (a twisting tornado structure) due to their azimuthal phase. This chirality is completely independent of that associated with the local state of polarisation. Early studies in the 2000s concluded this chirality of optical vortices can play no role in chiral light-matter interactions. Fast forward to 2018 and all of this changed, with multiple studies proving it was in fact possible. This talk aims to lay out a 'past, present, and future' perspective on this rapidly emerging field of 'chiral structured light'. We will provide a narrative of the field of research starting from its origin in those initial negative results all the way through to experiments highlighting the new and enhanced chiral light-matter interactions provided by structured light. Along the way we will develop and present the underlying theoretical breakthroughs. We will present and discuss a selection of current start-of-the-art results in the area, and conclude with some thoughts for future endeavours.

Primary author: FORBES, Kayn (University of East Anglia)

Presenter: FORBES, Kayn (University of East Anglia)

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