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Helicity and Angular Momentum in Nanophotonics

In this talk I will present our latest experimental and analytical results on the applications of conserved quantities to study problems of light-matter interaction at the subwavelength scale. At this scale,Maxwell equations cannot be easily approximated and the use of the symmetries of the system and their associated conserved quantities can greatly simplify the problems and give us further physical insight. I will particularly focus on two interesting conserved quantities:helicity and angular momentum and their related symmetries. I will show how they allow us to understand multitude of physical phenomena like: the transmission of light through nano-apertures, optical activity, spin-orbit interactions. If I have time, I will finish explaining some practical applications of these ideas in the fields of position metrology and transformational optics.