Physics AT QUEENS COLLEGE

Colloquium Notice

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Optical wave propagation in complex media: from pulse shaping to an invariance of the path length

Scattering of light in heterogeneous media, for instance the skin or a glass of milk, is usually considered an inevitable perturbation or even a nuisance. Through repeated scattering and interferences, this phenomenon seemingly destroys both the spatial and the phase information of any laser illumination. At the spatial level, it gives rise to the well-known “speckle” interference patterns. At the temporal (or spectral) level, a short pulse entering a scattering medium will see its length greatly extended due to the multiplicity of possible path length light can take before exiting the medium. From an operative point of view, scattering greatly limits the possibility to image or manipulate an object with light through or in a scattering medium. Multiple scattering is nonetheless an invaluable field of research for experimentalists and theoreticians alike, at the crossing of optics, condensed matter physics, statistical physics, chaos, to name just a few.

Multiple scattering is a highly complex but nonetheless deterministic process: it is therefore reversible, in the absence of absorption. Speckle is coherent, and can be coherently controlled. By « shaping » or « adapting » the incident light, it is in principle possible to control the propagation and overcome the scattering process. I will show our recent results on achieving a complete pulse control (spatial and temporal) by means of wavefront shaping. I will also show the experimental demonstration of a peculiar property of light in disorder, namely that the mean path length is independent of the disorder strength.

Wednesday
July 25, 2018
Starts at 12:15 PM
Coffee at 12:00 PM
Physics Conference Room, SB B326