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Nonlinear light propagation in photopolymers: from self-trapped beams to 3-D optical lattices KALAICHELVI SARAVANAMUTTU, McMaster University — While liquid crystals, surfactants and colloidal crystal systems assemble into ordered phases to attain free energy minima, strikingly complex patterns can also emerge when condensed matter systems are perturbed away from equilibria. This talk will be an overview of research in our group into the dynamics of light beams that propagate while simultaneously initiating free-radical polymerisation in photopolymers. The consequent nonlinear and reciprocal interactions between the optical field and self-induced refractive index changes in the medium elicit a rich assortment of three-dimensional spatial patterns. These include self-trapping bright and dark beams, beam filamentation due to modulation instability, diffraction rings due to self-phase modulation and the formation of 2-D and 3-D bright and dark optical lattices. The potential of these optical phenomena to spontaneously inscribe complex 3-D polymer architectures that are inaccessible through conventional lithographic techniques and that would have advanced optical applications such as nonlinear photonic crystals will also be described.

Kalaichelvi Saravanamuttu
McMaster University

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