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**Optical synthetic materials with local Parity-Time symmetry** MEI CHAI ZHENG, Wesleyan University, DEMETRIOS CHRISTODOULIDES, University of Central Florida, CREOL–The College of Optics and Photonics, RAGNAR FLEISCHMANN, MPI for Dynamics and Self-Organization, TSAMPIKOS KOTTOS, Wesleyan University and MPI for Dynamics and Self-Organization — We discuss the eigenvalue and eigenvector properties of a class of optical synthetic materials that are described by effective non-hermitian Hamiltonians with Parity-Time symmetry. The building blocks of such systems are coupled dimers with judiciously tailored internal structure such that one element of the dimer incorporates losses while the other balanced these losses with a gain. We show that these systems have a robust exact PT-phase (i.e. parameter regime of the gain/loss coefficient where the spectrum is real), even if the inter-dimer and intra-dimer couplings are random. We further analyze the beam dynamics in such optical lattices and show non-reciprocal diffraction beam evolution.

Mei Chai Zheng
Wesleyan University

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