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Spatiotemporal dynamics of optical pulse propagation in multimode fibers

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Optical fibers designed to support multiple transverse modes offer opportunities to study wave propagation in a setting that is intermediate between single-mode fiber and free-space propagation.
A variety of qualitatively-new phenomena have been observed recently in multimode fibers. Self-cleaning of a multimode beam is observed at a fraction of the critical power for self-focusing. New instabilities, which are spatiotemporal in nature, occur. By varying the launched spatial modes, it is possible to generate dispersive waves over one octave in frequency, or continua that span multiple octaves. One or two of these new phenomena will be presented along with their connection to multimode soliton dynamics. Recent progress spatiotemporal mode-locking in fiber lasers will then be summarized.
Possible directions for studies of new nonlinear wave physics in multimode fibers will be discussed along with potential applications.

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