This chapter gives a comprehensive review of collective soliton dynamics in passively mode-locked fiber lasers. It is first presented the multiple-pulsing properties occurring in ultrashort pulse fiber lasers. Theoretical and experimental results emphasize on multistability and hysteresis phenomena. Then we consider the formation of bound states obtained with high pumping power and involving hundreds of identical solitons, especially when the soliton distribution is analogous to the periodic arrangement of atoms in a crystal. The recent interest for complex multisoliton dynamics is covered. The soliton rain dynamics, which displays some analogy with the water cycle, is presented. Dynamics analogous to various states of matter, and chaotic multiple pulse dynamics, including noise-like pulses and dissipative rogue waves are also reported. It is evidenced that all these complex soliton patterns, which do not depend on the exact mode-locking mechanism, possess some universal character. We finally provide recent experimental developments of harmonic mode-locked (HML) fiber lasers, pointing out the possibility to induce HML by an external continuous component.

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