Solitons in complex integrable media

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Abstract: A nonlocal nonlinear Schroedinger (NLS) equation was recently introduced in Phys. Rev. Lett. **110**, 064105 (2013) and shown to be an integrable infinite dimensional Hamiltonian equation. Unlike the classical (local) case, here the nonlinearly induced "potential" is *PT* symmetric thus the nonlocal NLS equation is also *PT* symmetric. In this talk, new reverse space-time and reverse time nonlocal nonlinear integrable equations are discussed. They arise from remarkably simple symmetry reductions of a general scattering problems where the nonlocality appears in both space and time or time alone. They are integrable infinite dimensional Hamiltonian dynamical systems. These include the reverse space-time, and in some cases reverse time, nonlocal NLS, sine-Gordon, multi-dimensional three-wave interaction and "loop soliton. Lax pairs, an infinite number of conservation laws, inverse scattering transforms are discussed and one soliton solutions are found. Integrable reverse space-time and reverse time nonlocal discrete nonlinear Schroedinger type equations are also introduced along with few conserved quantities.