Kink solitons in Coulomb's chains
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Chains of identical ions, for which the dominant interaction is the electrostatic repulsion, appear in layered silicates. The ions can move almost from site to site. The chains do not explode because the surrounding media has a net negative charge which screens the Coulomb's repulsion and become attractive when the ions separate two much. Moreover there is a border effect which keeps the ions within the crystal.
We have been able to obtain moving supersonic kinks that keep their shape and cross nicely one with each other and can travel over the surrounding sea of phonons. Their energies can be very different, from the order of eVs to hundreds of them. Therefore they can influence many different processes within silicates.

Numerical study of Faraday waves in binary non-miscible Bose-Einstein condensates
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We show by extensive numerical simulations and analytical variational calculations that elongated binary non-miscible Bose-Einstein condensates subject to periodic modulations of the radial confinement exhibit a Faraday instability similar to that seen in one-component condensates. Considering the hyperfine states of Rb-87 condensates, we show that there are two experimentally relevant stationary state configurations: the one in which the components form a dark-bright symbiotic pair (the ground state of the system), and the one in which the components are segregated (first excited state). For each of these two configurations, we show numerically that far from resonances the Faraday waves excited in the two components are of similar periods, emerge simultaneously, and do not impact the dynamics of the bulk of the condensate. We derive analytically the period of the Faraday waves using a variational treatment of the coupled Gross-Pitaevskii equations combined with a Mathieu-type analysis for the selection mechanism of the excited waves. Finally, we show that for a modulation frequency close to twice that of the radial trapping, the emergent surface waves fade out in favor of a forceful collective mode that turns the two condensate components miscible.

Optical solitons in PT-symmetric nonlinear couplers with gain and loss
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The two-dimensional PT symmetric coupler with gain in one waveguide and loss in the other, supports two families of solitons. We show that their stability properties are completely determined by a single self-similar function of the gain/loss coefficient of the waveguides and the soliton's amplitude. Despite the presence of gain and loss, the evolution of small perturbations about the soliton is conservative.
One of the two types of solitons is found to be stable when its amplitude is lower than a certain threshold. The other soliton is always unstable but the instability growth rate becomes exponentially small when its amplitude decreases. The unstable solitons disperse, blow up or seed long-lived breathers.