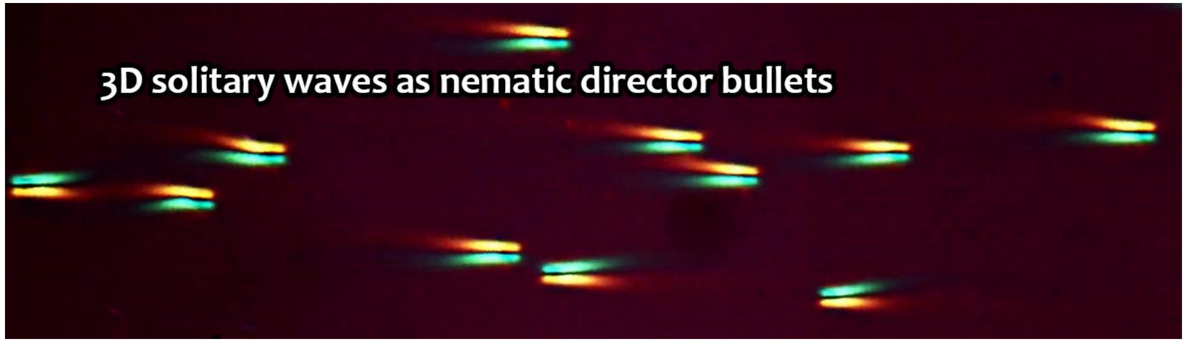
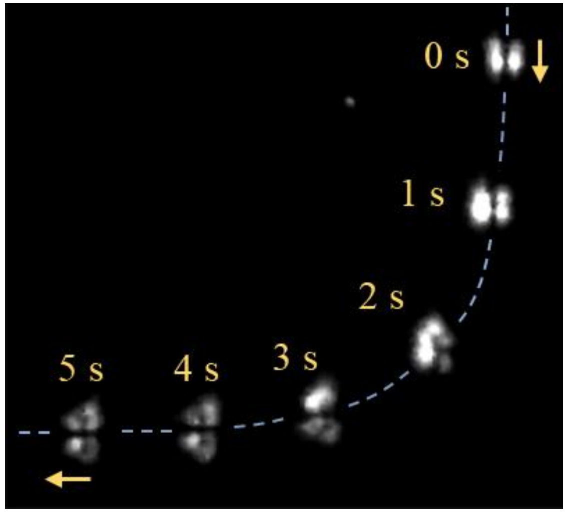
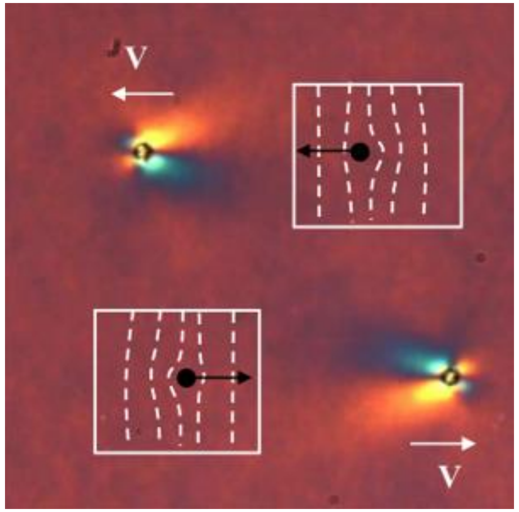
Prof. Oleg D. Lavrentovich's group produced 3D Steerable solitons/directrons in nematic liquid crystals

Production of stable multidimensional solitary waves is a grand challenge in modern science. Steering their propagation is an even harder problem. Dr. Bing-Xiang Li in Prof. Oleg D. Lavrentovich's group has successfully produced three-dimensional (3D) steerable solitary waves of director deformations driven by an alternating current electric field [1,2]. The soliton waves are called director bullets or directrons. The experiments suggest the existence of directrons results from a balance of various mechanisms of the electric field-nematic coupling, such as flexoelectric polarization, anisotropy of dielectric permittivity, conductivity and its anisotropy. In their recent work, they demonstrate that a directron can couple with a spherical colloid and move it [3].







[1] B.-X. Li, V. Borshch, R.-L. Xiao, S. Paladugu1, T. Turiv, S. V. Shiyanovskii, and O. D. Lavrentovich, Electrically driven three dimensional solitary waves as director bullets in nematic liquid crystals, ***Nature Communications*** 9, 2912, 2018.

[2] B.-X. Li, R.-L. Xiao, S. Paladugu, S. V. Shiyanovskii, and O. D. Lavrentovich, Three-dimensional solitary waves with electrically tunable direction of propagation in nematics, ***Nature Communications*** 10, 3749, 2019.

[3] B.-X. Li, R.-L. Xiao, S. V. Shiyanovskii, and O. D. Lavrentovich, Soliton-induced liquid crystal enabled electrophoresis, ***Physical Review Research,*** in press, 2020.